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Gender, Caste, and Public Goods Provision in Indian Village Governments

Kiran Gajwani

Xiaobo Zhang

Development Strategy and Governance Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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AUTHORS

Xiaobo Zhang, International Food Policy Research Institute

Senior Research Fellow, Development Strategy and Governance Division

Correspondence can be sent to x.zhang@cgiar.org

Kiran Gajwani, Cornell University (*during the writing of this paper*)

PhD student, Department of Applied Economics and Management

Scripps College, (*current*)

Assistant Professor, Department of Economics

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Contents

Acknowledgments	vi
Abstract	vii
1. Introduction	1
2. The Setting	4
3. The Data	9
4. The Empirical Strategy	11
5. The Analysis	13
6. Concluding Comments	26
Appendix	27
References	49

List of Tables

1.	Female and SC population ratios, by block	6
2.	Differences between GPs unreserved and reserved for female presidents (Year=1991)	7
3.	Differences between GPs unreserved and reserved for SC presidents (Year=1991)	8
4.	Description of survey schedules and interviewees	9
5.	Results of 17-question GP knowledge test	13
6.	Preferences for Infrastructure, by gender (percent of group with response in top 3)	14
7.	Public goods measures used in analysis	15
8.	DID estimation without controls for GPs reserved and unreserved for female presidents	15
9.	DID estimation with controls for GPs reserved and unreserved for female presidents	17
10.	Reserved-female presidents' contact with higher-level panchayat officials	19
11.	Preferences for infrastructure, by caste (percent of group with response in top 3)	21
12.	DID estimation without controls for GPs reserved and unreserved for SC presidents	22
13.	DID estimation with controls for gps reserved and unreserved for SC presidents	24
14.	Reserved-SC presidents' contact with higher-level panchayat officials	25
A.1.	Differences in village characteristics in 1991: GPs with and without errors in reservation status for SC presidents	31
A.2.	Differences in public goods in 1991: GPs with and without errors in reservation status for SC presidents	32
A.3.	Differences in village characteristics in 1991: GPS with and without errors in reservation status for female presidents	33
A.4.	Differences in public goods in 1991: GPs with and without errors in reservation status for female presidents	34
A.5.	DID estimation with covariates for GPs reserved and unreserved for female presidents (I)	35
A.6.	DID estimation with covariates for GPs reserved and unreserved for female presidents (II)	36
A.7.	DID estimation with covariates for GPs reserved and unreserved for female presidents (III)	37
A.8.	DID estimation with covariates for GPs reserved and unreserved for female presidents (IV)	38
A.9.	DID estimation with covariates for GPs reserved and unreserved for female presidents (V)	39
A.10.	DID estimation with covariates for GPs reserved and unreserved for SC presidents (I)	40
A.11.	DID estimation with covariates for GPs reserved and unreserved for SC presidents (II)	41
A.12.	DID estimation with covariates for GPs reserved and unreserved for SC presidents (III)	42
A.14.	DID estimation with covariates for GPs reserved and unreserved for SC presidents (V)	44
A.15.	DID PSM estimates of the average treatment effect on the treated	46

List of Figures

1.	Map of India	4
2.	The districts of Tamil Nadu	10
A.1.	Coimbatore District (Women)	27
A.2.	Pudukottai District (Women)	28
A.3.	Vellore District (Women)	28
A.4.	Coimbatore District (SC)	29
A.5.	Pudukottai District (SC)	29
A.6.	Vellore District (SC)	30
A.7.	DID PSM, common support for Model 1	47
A.8.	DID PSM, common support for Model 2	47
A.9.	DID PSM, common support for Model 3	48
A.10.	DID PSM, common support for Model 4	48

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ABSTRACT

This paper seeks to contribute to the literature on village governance and local public goods provision. Using data from 144 village-level governments in India's Tamil Nadu state, we examine whether the gender and caste of village government leaders influence village public goods provision. In particular, we examine: 1) whether public goods are provided in accordance with gender or caste preferences; and 2) whether public goods provision differs based on the knowledge level of the village government leader. We find evidence of different preferences for public goods between men and women, and between Scheduled Caste (SC) and non-SC persons. Additionally, a test of knowledge regarding the village government reveals that female and SC presidents receive lower scores relative to male and non-SC presidents, with women scoring lowest overall. We find that preferences and knowledge have little effect on public goods provision by female presidents, and hypothesize that this may be due to the influence of their male spouses. In the context of SC presidents, we find evidence that SC presidents provide more drinking water access—a location-specific public good—to SC-inhabited village areas.

Keywords: local governance, public goods provision, gender, caste, India

1. INTRODUCTION

Decentralization of governance has been a common phenomenon in developing countries since the 1990s, largely owing to the relative inability of centralized governments to tackle poverty. Some of the many oft-cited benefits of decentralization compared to more centralized governance are that local governments can better serve the needs and identify the preferences of their constituents (Prud'homme, 1995); they can better enforce and coordinate policies and programs (Prud'homme, 1995); they may be less corrupt than centralized governments (Bardhan, 2002); and they can be more easily monitored by citizens (World Bank, 2000).

However, empowering local government bodies to provide public goods and services can create new problems when a population is very heterogeneous. In particular, politicians may favor their home areas or ethnic groups—which provide them with votes—with increased expenditures at the expense of other minorities. Indeed, capture by the elite or majority is often problematic in a democratic system (Bardhan, 2002). In an effort to overcome the capture problem, some countries have adopted reservation or affirmative action policies to protect under-represented groups. The large-scale reservation policies adopted in India—an extremely diversified country in terms of race, caste, and religion—provide an excellent setting for evaluating the impact of reservation policies.

While India attempted decentralization to the village level several times following the country's independence in 1947, decentralization in India was largely advanced in the early 1990s with the enactment of the 73rd and 74th Constitutional Amendments. The 73rd Amendment,¹ which focused on decentralization in rural areas, required the creation of three tiers of sub-state governance at the district, block (or union), and village levels in each of India's 28 states.² These local governments take the name *panchayat* from the village councils that have existed for hundreds of years in some parts of India (DHAN, 2006). Panchayat comes from the word '*panch*' (meaning 'five'), as the old village governments used to have five members, each elected every five years. The five-year terms still hold for modern-day panchayats. India presently has about 500 district, 6000 block and 230,000 village panchayats.³ While the creation of three levels of panchayats is compulsory for all states, the states can use their discretion in determining the specific duties and funding of the panchayats.

The 73rd Amendment notably calls for reservation of seats at all levels of the panchayats for women and Scheduled Caste⁴ persons. Village panchayats, known as gram panchayats (GPs), have recently received a great deal of attention in the literature. A minimum of one-third of the GPs presidents' seats within a state must be reserved for women, and another portion are reserved for Scheduled Caste (SC) and Scheduled Tribe (ST) persons, based on the composition of SC/ST persons within the state. These mandatory reservations⁵ are well-suited for empirical analyses of the role of GPs in public goods provision, and the extent of influence of the GP president (known in some states as the *pradhan*). In reality, the reservation system is largely followed; Chattopadhyay and Duflo (2004) cite 100 percent compliance with the reservation policy for women in West Bengal and Rajasthan (p. 1414), while we find 97 percent compliance in our sample of GPs from Tamil Nadu state.⁶

The work of Chattopadhyay and Duflo (2004) was the first major attempt to empirically analyze the effect of women politicians in India. Because women's performance as politicians may be correlated

¹ The 74th Amendment applies to municipalities, while the 73rd is for rural areas.

² India's seven Union Territories are headed by a federal government-appointed administrator.

³ See Mahal et al. (2000) for a detailed description of the functions, duties, et cetera at each level of the panchayats for several states.

⁴ "Scheduled Caste" refers to persons of a group historically found at the bottom of India's caste system of social hierarchy. This group was formerly referred to as the "Untouchables."

⁵ Reservation of seats for women and SC/ST persons is required for all elected positions in the three tiers of the panchayats; we herein focus solely on the position of GP president.

⁶ However, the assignment of the reservations was not implemented perfectly in Tamil Nadu. We discuss this in more detail in Section 2.

with the place where they were elected, it can be difficult to separately assess the effect of women on political outcomes. However, when female-reserved seats are randomly assigned,⁷ this endogeneity is overcome, and differences found in performance between male and female presidents can confidently be attributed to gender. Such an analysis is undertaken in Chattopadhyay and Duflo (2004), and the results show significantly different provision of public goods by male and female presidents in the GPs of West Bengal and Rajasthan states. Using data on female presidents and public goods provision in GPs, combined with data on women's preferences, the authors show that female village leaders invest more in public goods considered important by women, such as drinking water and roads in West Bengal GPs, and drinking water in Rajasthan GPs.

However, Ban and Rao (2008) find that female presidents in women-reserved GPs do not perform any differently than men. In particular, the authors find that female presidents do not provide public goods in line with their preferences, nor do they provide fewer public goods than men. They also find that, in the four states of Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu, the majority of women were not persuaded by their husbands to run for the presidential seat in women-reserved GPs. This finding on husbands' influence (or lack thereof), however, comes from pooled data on female presidents' across all four states, and therefore does not capture possible variation between states.

The effect of SC reservations on public goods provision in India has been studied at the constituency and state levels in Banerjee and Somanathan (2007) and Pande (2003), respectively. Banerjee and Somanathan (2007) examine villages' access to public goods, using data at the constituency level in 15 Indian states. They find evidence of convergence in villages' access to public goods; constituencies with greater concentrations of SC persons had better village access to public goods in 1991 compared to 1971. Banerjee and Somanathan credit this improvement to the following: 1) Indian government programs aimed at equalizing public goods access; and 2) SC persons becoming politically mobilized and active from the 1980s onwards. Pande (2003), using a panel of state-level data from 1960-1992, finds that SC and ST reservations at the state level increase the transfers to SC and ST persons, in the form of increased job quotas and increased welfare spending.

Besley et al. (2004) examine village-level SC reservations and public goods provision by analyzing various aspects of local governance using a World Bank dataset from the four Southern Indian states of Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu. Regarding reservation policies and outcomes, the authors show that GPs with SC/ST-reserved presidents have a significantly positive effect of on SC/ST households, which are about six percent more likely to receive a local (or 'household') public good compared to SC/ST households in non-SC/ST-reserved GPs.

The goal of this paper is to better understand the performance of female and SC presidents, to specifically examine the case of Tamil Nadu, and to provide insight into means for improving public goods provision in rural India. This issue is important for several reasons. First, 75 percent of India's poor reside in rural areas. Second, the empowerment of women in developing countries has come to the forefront of development; it is one of the eight Millennium Development Goals, and the World Bank has put gender empowerment high on their agenda, stating that gender inequality hinders development and poverty reduction (World Bank, 2001). Inasmuch as the empowerment of women embodies their inclusion in governance—a statistic that has increased in recent years—it is important to empirically study the performance of women in developing country governments. Third, SC persons often come from more disadvantaged backgrounds, and have lower incomes, education, and literacy rates. While their inclusion in village governance is important, it is still necessary to evaluate their performance while in office.

This paper contributes to the literature on the effectiveness of women and SC persons in India's village governments by building upon the previously discussed work⁸ in the following four ways. (1) We

⁷ Random assignment of reservation seats is not as common as implied in the literature, and is not a national or required feature of India's reservation policies. Indeed, states are free to decide how to select seats for reservation in the panchayats, and many chose to assign reserved seats based on population ratios.

⁸ In this paper, we focus on the literature examining decentralized governance in India. Analyses of decentralization and

duplicate the analysis of Chattopadhyay and Duflo (2004) and Ban and Rao (2008) in Tamil Nadu, and examine whether the findings are context-specific from state to state. (2) We develop an extremely detailed village-level dataset for two time periods, as opposed to the recall data on public goods used by both Chattopadhyay and Duflo (2004) and Ban and Rao (2008). This allows us to perform a more precise difference-in-differences analysis. We also use many outcome variables to measure provision of public goods by the GP, allowing us to check the robustness of our results. (3) We include the results from a test given to GP presidents, providing data on presidents' knowledge of the GP rules and regulations. (4) We examine the reservation policies for women and SC presidents in the same setting, even though these are often discussed separately in the literature.

We find that although preferences for public goods differ across gender and caste, female and male presidents provide public goods similarly. In other words, female presidents are not providing public goods according to their preferences, as suggested by Chattopadhyay and Duflo (2004). However, we find some support for the notion that SC presidents provide more location-specific public goods—namely, access to potable water—relative to non-SC presidents, and favor SC-inhabited areas of villages in this provision.

In the next section, we discuss the history and governmental setting in Tamil Nadu state, and then explain our survey in Tamil Nadu. We then describe our empirical strategy for estimating the effect of having a reserved seat in a GP. Following that, we analyze the performance of female and SC presidents, and estimate the effect of gender and caste on public goods provision in reserved GPs. We finish with some concluding thoughts.

public goods provision have been undertaken in other countries; see, for example, Faguet (2004), West and Wong (1995), Zhang et al. (2004), and Zhang and Zhou (2001).

2. THE SETTING

Located in the southernmost region of India (see Figure 1), Tamil Nadu was originally part of the Madras State after India's independence in 1947, and became present-day Tamil Nadu in 1968. Today, Tamil Nadu is bordered by Andhra Pradesh and Karnataka to the North, Kerala to the West, and by the coastline to the East and South. It is the sixth most populous state in India. The agricultural sector is the main source of income, employing 70 percent of the state's population. Tamil Nadu incorporated the 73rd Constitutional Amendment into its state constitution in the 1994 Tamil Nadu Panchayat Act. Its first panchayat elections were held in 1996, the second in 2001, and the third in 2006.

Figure 1. Map of India



Prior to the Tamil Nadu Panchayat Act and the 1996 elections, village governance was very different than after 1996. In the 1960s and 1970s, Tamil Nadu had village level panchayats, but the presidents were internally selected from among several ward members (individuals who represented

different ‘neighborhoods’ of the village). From roughly the 1980s through to the enactment of the Tamil Nadu Panchayat Act, nearly all activities at the village level were carried out through the block development officer (BDO). From the 1996 GP elections onwards, village level governance has consisted of the GPs, with direct election of the president by the GP citizens.

GP reservations in Tamil Nadu hold for 10 years (two election terms), as opposed to the one-term reservations used in many other states. The selection of GPs for reservation—for both women and SC/ST—is done at the block level. Tamil Nadu does not randomly select GPs in which to reserve seats for women and SC/ST persons. For the 1996 elections (the first elections following the Tamil Nadu Panchayat Act), one-third of GPs in each block were reserved for women and 20 percent were set aside for SC/ST presidents. The reserved GPs are chosen as follows:

1. All GPs within a block are arranged in descending order of the ratio of SC persons to the total population. The top 20 percent are set aside for SC/ST reservations.
2. If the ST population in a block is above a certain level, one GP is reserved for an ST president. If not, all 20 percent of SC/ST reservations chosen in part (1) are set for SC reservation.⁹
3. The GPs in the 20 percent reserved for SC/ST reservations are arranged in descending order of the ratio of female SC persons to the total SC population. The top one-third is reserved for female SC presidents.
4. The remaining GPs are sorted in descending order of the ratio of females to the total population. The top one-third is reserved for female presidents.
5. All reservations hold for 10 years, or two terms. After 10 years, this same procedure is implemented, except that the GPs previously reserved for SC/ST presidents are excluded from step (1) and the GPs previously reserved for women are excluded from step (4).

Given this method for assigning reservations to GPs, a regression discontinuity (RD) approach¹⁰ would be ideal for identifying the effect of reservations on differences in public goods provision. However, we found that the assignment of reservations is performed imperfectly. Reservations are implemented at the block level, and the 12 blocks in our sample have, on average, a 27.3 percent error rate in women-reserved GPs, and a 39.1 percent error rate in SC-reserved GPs.¹¹ Given our relatively small sample size, combined with errors in reservation assignment, we cannot follow the RD approach. Therefore, we use an ordinary least squares estimation procedure—using the difference-in-differences method—to identify the effect of reservations on public goods provision.

Although the assignment of reservations was not a completely random process in 1996 due to the ordering of GPs by population ratios, we believe that reservations for women are not related to any unobserved determinants of public goods provision. This argument can be made on the following grounds: (i) the women-to-total population ratio is extremely similar across GPs in a block, as shown in Table 1; (ii) GPs selected for female reservation do not significantly differ from non-reserved GPs in a number of other village attributes analyzed herein, as shown in Table 2;¹² and (iii) a t-test of the

⁹ No GPs in our sample were selected for ST reservation; because the ST population in Tamil Nadu is very small, few (if any) GPs in Tamil Nadu are selected for ST reservation overall.

¹⁰ A regression discontinuity (RD) approach involves comparing observations just above and just below the cutoff population ratios for reservation.

¹¹ The error rate is calculated as the percent of reserved GPs that should not have been reserved, based on the population ratio threshold rule that should have been followed. We compare village characteristics and public goods characteristics in 1991 between GPs with and without an error in their reservation status. The results are presented and discussed in the Appendix. Overall, we do not find evidence to suggest that errors in the assignment of reservations are correlated with factors that influence public goods provision.

¹² One exception is that the number of Christian households is significantly greater in unreserved villages; however, Christian households comprise less than two percent of total households in our sample, so we are not concerned with this

difference in mean public goods levels in 1991 (before the reservation assignments were made) shows that GPs selected for female reservation in 1996 do not significantly differ from unreserved GPs in any of the nine public goods measures we use in this analysis.¹³

In the case of SC reservations, however, it is clear that the percentage of the SC population is not the same in every GP within a block. Table 1 also shows that the ratio of SC persons to the total population in a GP fluctuates widely across GPs, while Table 3 shows that some village attributes vary across SC-reserved GPs.

Despite these shortcomings in the selection of seats for reservation, we first perform an analysis without correcting for non-randomness. We then undertake additional analyses to address the non-randomness, and to test the robustness of our results.

Table 1. Female and SC population ratios, by block

District	Block	GPs per block in sample	Mean, female/total population ratio	Standard Deviation	Mean, SC/total population ratio	Standard Deviation
Coimbatore	Avinashi	12	0.4795	0.0166	0.2558	0.0611
	Gudimangalam	12	0.4966	0.0114	0.2669	0.0644
	Palladam	12	0.4909	0.0131	0.2093	0.0558
	Pollachi (North)	12	0.4876	0.0131	0.2177	0.0919
Pudukottai	Aranthangi	12	0.5091	0.0213	0.0979	0.0547
	Karambakudi	12	0.4986	0.0116	0.2855	0.1692
	Kunnandar Koil	12	0.4946	0.0096	0.1731	0.1229
	Ponnamaravathi	12	0.5186	0.016	0.1774	0.1132
Vellore	K.V.Kuppam	12	0.4943	0.0149	0.2866	0.1765
	Kanniyambadi	12	0.5051	0.0113	0.2421	0.1111
	Natrampalli	12	0.4915	0.0095	0.2235	0.1761
	Nemeli	12	0.4963	0.0122	0.2897	0.1735

difference.

¹³ This is shown later in the paper, in Table 8.

Table 2. Differences between GPs unreserved and reserved for female presidents (Year=1991)

Variable	Mean, Unreserved GP	Mean, Reserved GP	Difference
Village population –total	2584.24	2699.36	-115.12 <i>0.68</i>
Village under six years of age	318.21	312.97	5.24 <i>0.89</i>
Ratio of females to total population	0.495	0.503	-0.008** <i>0.017</i>
Backward Caste (BC) population	715.62	1012.21	-296.59 <i>0.25</i>
Scheduled Caste (SC) population	550.62	604.79	-54.17 <i>0.49</i>
Households total	576.69	636.73	-60.03 <i>0.37</i>
Hindu households	545.59	615.67	-70.08 <i>0.29</i>
Muslim households	19.53	15.27	4.26 <i>0.38</i>
Christian households	11.58	5.79	5.79* <i>0.06</i>
Farm households	319.14	346.58	-27.44 <i>0.51</i>
Village citizens working in village	561.45	548.58	12.87 <i>0.88</i>
Female village citizens working in village	60.5	60.91	-0.41 <i>0.97</i>
Total cultivated land (acres)	2173.92	2353.22	-179.3 <i>0.59</i>
Literates	1171.82	1335.3	-163.48 <i>0.27</i>

Notes: - P-values are given in italics.

- Indicates significance at *10%, **5%, ***1%.

- Backward Caste refers to socially and economically disadvantaged castes, other than the Scheduled Caste.

Table 3. Differences between GPs unreserved and reserved for SC presidents (Year=1991)

Variable	Mean, Unreserved GP	Mean, Reserved GP	Difference
Village population - total	2699.19	2189.04	510.15* <i>0.1</i>
Village population - under six years of age	327.01	269.4	57.61 <i>0.18</i>
Ratio of females to total population	0.496	0.499	-0.003 <i>0.46</i>
Backward Caste (BC) population	804.43	684.4	120.03 <i>0.67</i>
Scheduled Caste (SC) population	524.01	748.8	-224.79*** <i>0.01</i>
Households total	606.27	515.16	91.11 <i>0.22</i>
Hindu households	577.03	488.44	88.59 <i>0.22</i>
Muslim households	18.99	16.48	2.51 <i>0.64</i>
Christian households	10.25	10.24	0.01 <i>0.99</i>
Farm households	334.01	284.56	49.45 <i>0.28</i>
Village citizens working in village	563.26	535.84	27.42 <i>0.77</i>
Female village citizens working in village	60.89	59.16	1.73 <i>0.88</i>
Total cultivated land (acres)	2279.85	1906.36	373.49 <i>0.31</i>
Literates	1237.06	1077.08	159.98 <i>0.33</i>

Notes: - P-values are given in italics.

- Indicates significance at *10%, **5%, ***1%.

3. THE DATA

The data for this study come from village-level surveys implemented through a joint research project of the International Food Policy Research Institute (IFPRI) and Tamil Nadu Agricultural University (TNAU). Based on the human development index for each district, the districts of Tamil Nadu were divided into three categories: Developed, Moderately Developed, and Less Developed. For the survey, one district was randomly selected from each of the three categories listed above, from which four Block Panchayats (BPs) were randomly chosen. From each of the 12 BPs, 12 GPs were randomly selected, making a total of 12 BPs and 144 GPs from the three districts. The survey involved five different interview schedules, as outlined in Table 4. The three districts from which the 144 GPs for this survey were selected—Coimbatore, Pudukottai, and Vellore—are highlighted in Figure 2.

Table 4. Description of survey schedules and interviewees

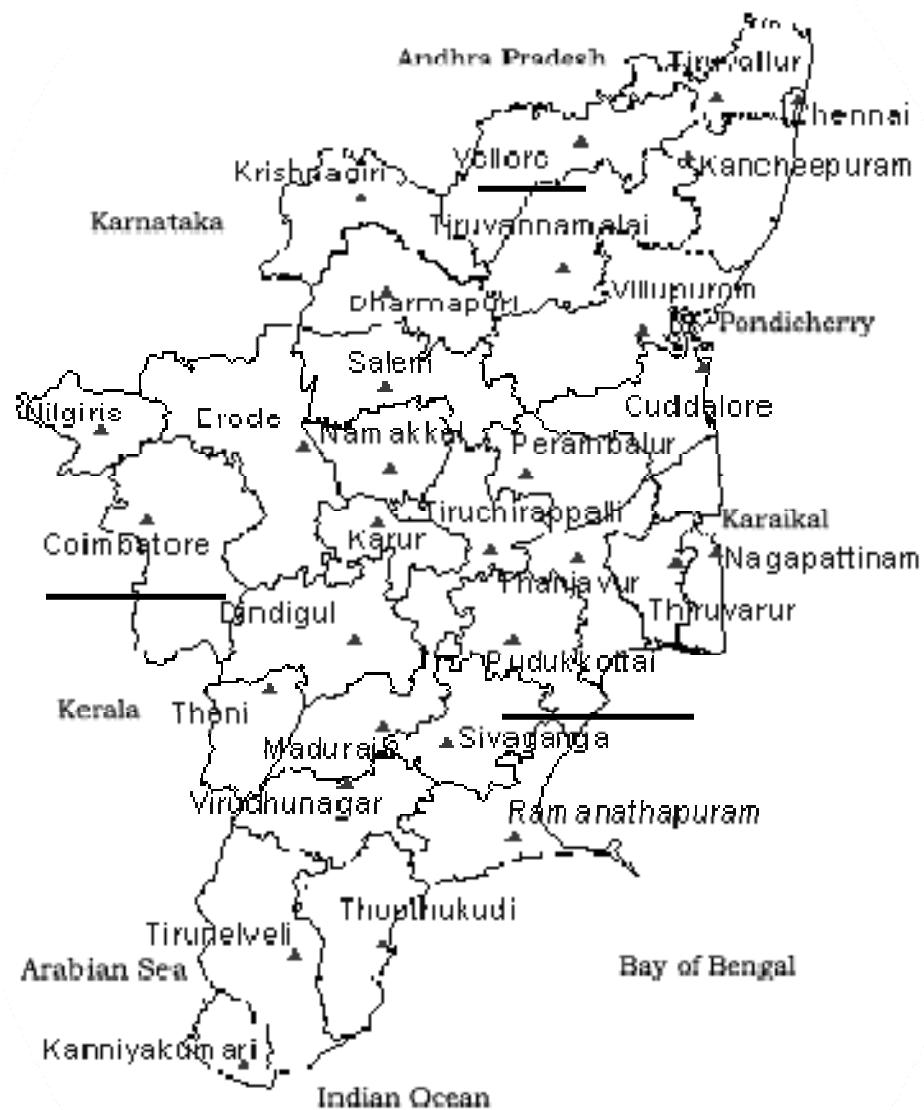
Schedule	Interviewee	Total Number Collected per District
<i>Profile characteristics of village Panchayat President/Ward Councilor and activities of the Panchayat</i>	1) GP president 2) 1 ward member	1) 48 2) 48
<i>Voter's interview</i>	10 randomly selected voters per village; 6 from main village (3 men, 3 women), 4 from hamlets (2 men, 2 women)	90
<i>Focus group discussion</i>	4 randomly selected citizens per village	36
<i>Interaction schedule*</i>	1) DP and state government 2) BP , local bodies and administration 3) GP and BP 4) local bodies and administration	3 (1 per block)
<i>Secondary data schedule</i>	An extensive compilation of village, citizen, and panchayat council characteristics	48 (1 per village)

Notes: * **Bold** indicates the interviewee.

The interviewee was surveyed about his/her relationship(s) with the other body(ies) listed.

DP refers to the District Panchayat, BP refers to the Block (or Union) Panchayat, and GP is the Gram Panchayat.

Figure 2. The districts of Tamil Nadu



4. THE EMPIRICAL STRATEGY

This study aims to examine the treatment effect of reserving the GP president's position for women and SC persons. The impact of a reservation is given by estimating θ , where

$$y_i = \alpha + X_i\beta + \theta D_i + \varepsilon_i, \quad (1)$$

y is a measure of public goods at the GP level, and D is a dummy variable for reservation that takes on a value of 0 for unreserved GPs and 1 for reserved GPs. Then,

$$E[\theta] = E[y_i/X_i, D_i = 1] - E[y_i/X_i, D_i = 0], \quad (2)$$

where $\hat{\theta}$ is the least-squares estimate of θ and the conditioning variables, X_i , control for those things correlated with D_i that could affect y_i . However, unobservable factors that affect the receipt of treatment are present in the error term and may lead to biased estimates of θ . Such unobservables include caste or gender biases among citizens in certain villages. For example, a GP with a higher female population ratio may be more pro-female, meaning that a female president could have more influence in this GP compared to a GP with a lower female population ratio.

Our task is to estimate the effect of reservation by comparing reserved and unreserved GPs. However, because we can never observe a reserved GP in the absence of a reservation,¹⁴ estimates of the effect of reservation can be biased, as described above. One technique to control for potential bias caused by unobservable factors is a difference-in-differences (DID) estimation strategy.¹⁵

Difference-in-Differences Estimation

DID estimation uses a control group and an experimental group, and observations in at least two time periods: one before the 'change' and one after. The benefit of using the DID approach is that, even if there are unobservable factors that influenced a GP's reservation status and could affect public goods provision, our estimate of the effect of reservation on public goods provision will be unbiased if those factors do not change over time.

In its most general form, the DID estimator compares the change over time between the two groups. In our setting, consider the unreserved (U) and reserved (R) GPs, and the time periods 1991 (before the local governance and reservation policies were put in place in Tamil Nadu) and 2005 (the fourth year of the second term in office, or the ninth year of the 10-year reservations).¹⁶ In this case, the DID estimator is given by:

$$DID = (y_{R,2005} - y_{R,1991}) - (y_{U,2005} - y_{U,1991}), \quad (3)$$

where y is the dependent variable of interest, group R contains the reserved GPs, group U contains the unreserved GPs, and $\bar{y}_{g,t}$ is the mean value of y for group g and time t . Note that the DID estimator can also be obtained from a regression of the form

$$y = \alpha + \beta_1 \text{RESERVED} + \beta_2 2005 + \beta_3 (\text{RESERVED} \cdot 2005) + \varepsilon, \quad (4)$$

¹⁴ The inability to ever observe the counterfactual is known as the fundamental problem of causal inference.

¹⁵ For the case of analyzing SC-reserved GPs, we also use a Propensity Score Matching (PSM) estimation to test the robustness of our results. This work and the associated results are presented in the Appendix.

¹⁶ Note: The data on public toilets, household toilets, and buses and minibuses are from 1995 and 2004. Since 1996 was the first year of reservation, these years are suitable for the analysis, as they provide data from before reservation and from the eighth year of the reservation.

where RESERVED is a dummy variable equaling one for reserved GPs and 2005 is a dummy variable equaling 1 for observations occurring in 2005. β_3 is the DID estimator.

Because of the way in which GPs were selected for reservation, we additionally perform a DID estimation while controlling for covariates. The DID estimate is then given by β_3 of the following regression:

$$y = \alpha + \beta_1 \text{RESERVED} + \beta_2 2005 + \beta_3 (\text{RESERVED} \cdot 2005) + \beta_4 \mathbf{X} + \varepsilon, \quad (5)$$

where \mathbf{X} is a vector of covariates, including the GP's female and SC population ratios in 1991, i.e. the values on which the reservations are based. Controlling for these variables allows us to further refine our estimate of the treatment effect. In particular, the assumption required for an unbiased DID estimate is that any unobservable factors that influence whether a GP received treatment and affect the GP's public goods outcomes change the same in both treated and untreated villages. This is a much weaker assumption than random assignment of reservations. The further refinement of adding covariates to the DID estimation means that our DID estimate will still be accurate if, for example, there are differences in GPs with different population ratios (which in turn influence a GP's reservation status) and these differences change at different rates compared to unreserved villages.

5. THE ANALYSIS

Panchayat Reservation for Women

Of the 144 villages in our survey, 33 have GPs with presidential seats reserved for women. Only one failed to comply with the reservation policy by seating a male president. The women are on average 43 years of age (ranging from 29 to 58), and 61 percent of them cite farming as their primary occupation. Forty-two percent of the women cite the reservation of the presidential seat as their primary motivation for running for office, one-third cite past work with the community as their motivation, and 24 percent cite “other” reasons.

The literacy rate for women in Tamil Nadu is very high at 64.4 percent, compared to the all-India female literacy rate of 53.7 percent. The education level of the female presidents in our sample is very comparable to that of male presidents: 63.6 and 66 percent of male and female presidents, respectively, have at least a high school education. However, on a test of GP knowledge, female presidents scored very low. As shown in Table 5, only 36 percent of female presidents in women-reserved GPs answered at least half of the test questions correctly, compared to 83 percent of the male presidents. Given such poor knowledge of the GP, one might initially expect the performance of female presidents in women-reserved GPs to suffer.

Table 5. Results of 17-question GP knowledge test

	8 or fewer questions correct	9 or more questions correct
Male Presidents	17.00%	83.00%
Female Presidents	63.60%	36.40%
Non-SC Presidents	28.70%	71.30%
SC Presidents	41.38%	58.62%

In this first part of our analysis, we focus on the GP president and the role of gender in public goods provision, checking to see (i) if men and women in Tamil Nadu have different preferences for public goods, and (ii) if female and male presidents differ in their provision of public goods.

Preferences

We start by estimating male and female preferences for public goods. We then compare the means of different measures of public goods provision in reserved and non-reserved villages, to examine whether female presidents provide public goods according to their preferences.

We examine citizens' preferences using direct questions from a survey posed to 270 citizens randomly sampled in 27 villages over the three districts surveyed in Tamil Nadu. One question specifically asked citizens to list up to five infrastructure items needed in their village. All persons of a given GP were surveyed from the same village, so no bias resulted from different provisions in different villages of the GP. Table 6 lists the percentage of people who gave the noted answer within their top three responses.¹⁷ More than 30 different responses were given by the group of 270 citizens; we report the top 10 responses that were jointly mentioned by the largest percentage of people.

From Table 6, we see that women cite a need for drainage and buses significantly more than men, and cite drinking water more often than men, though not significant at a 10 percent level of significance.

¹⁷ Because many people gave the response “No Comment” for their fourth and/or fifth responses, we use only the first three responses given by citizens for estimating their preferences for public goods, with the idea that the first three items given by respondents are likely to be the ones they consider most important.

Men, on the other hand, cite the need for roads and school/education significantly more often than women.

Table 6. Preferences for Infrastructure, by gender (percent of group with response in top 3)

Response	Mean, Men	Mean, Women	Difference*
Drinking water	0.4676	0.5573	-0.0896 <i>0.142</i>
Health/Hospital	0.4173	0.4504	-0.0331 <i>0.585</i>
Roads	0.3813	0.2672	0.1141** <i>0.046</i>
School/Education	0.2950	0.2061	0.0889* <i>0.093</i>
Sanitation	0.2374	0.1756	0.0618 <i>0.212</i>
Drainage	0.1871	0.2824	-0.0954* <i>0.0644</i>
Buses	0.1295	0.2214	-0.0919** <i>0.0468</i>
Group houses	0.1007	0.1221	-0.0214 <i>0.577</i>
Individual pipeline or toilet connection	0.0719	0.0992	-0.0273 <i>0.424</i>
Streetlights	0.0935	0.0763	0.0172 <i>0.615</i>

- P-values are given in italics.

- Significant at ***1%, **5%, and *10%.

Provision

To test whether these differences in preferences for types of public goods are reflected in the provision of public goods by male and female presidents, we next compare the difference in public goods outcomes across unreserved and reserved GPs. The comparison is straightforward; we use a DID estimation procedure to compare means across the two groups from the two time periods.

We have data on many measures of public goods provision in the GPs, but we restrict this analysis to measures of public goods that coincide with the citizens' noted preferences for infrastructure, as described in the previous section. Table 7 presents the public goods measure(s) we use for each preference revealed in Table 6.¹⁸ Note that these variables reflect changes in infrastructure during a president's time in office, as well as changes in outcomes. For example, we use data on the number of schools to measure investment in schools and education, while we use data on the number of children given various immunizations as an outcome measure of investment in health. These measures are used in a DID estimation strategy, with the DID estimation results given in Table 8.

¹⁸ Variables for drainage and group housing are not used in the analysis even though they appear in the top 10 of listed infrastructure needs; this is because we do not have complete data on these variables for the 144 GPs covered in our sample.

Table 7. Public goods measures used in analysis

Response from Preferences	Public Goods Measures
Drinking water	Number of borewells; distance to nearest borewell
Health/Hospital	Composite measure ^a of the percentage of children given any immunizations of: DPT, BCG, MMR, OPV, Measles, Tetanus-Toxoid
Roads	Distance to nearest concrete road (in kilometers)
School/Education	Total number of schools in the village
Sanitation	Number of public toilets
Buses	Number of bus and minibus trips
Individual pipeline/ Toilet connection	Composite measure ^a of the number of households with a drinking water connection and the number of households with a toilet
Streetlights	Composite measure ^a of the number of streetlights in village and the number of operational streetlights in village

^aThe 'composite measure' is a weighted average of all of the factors listed in each group. The weighted values are calculated using a simple factor analysis procedure.

Table 8. DID estimation without controls for GPs reserved and unreserved for female presidents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Reserved for Women</i>		<i>Unreserved GPs</i>		<i>Time Period Difference</i>		DID
	Mean 1991	Mean 2005	Mean 1991	Mean 2005	Reserved	Unreserved	Estimator
Number of borewells	3.16 (3.35)	5.78 (4.95)	2.97 (2.94)	5.93 (5.79)	2.63 [0.42]	2.96 [0.35]	-0.34 [0.70]
Distance to nearest borewell	0.26 (0.22)	0.23 (0.22)	0.22 (0.22)	0.22 (0.27)	-0.03 [0.02]	0.00 [0.02]	-0.03 [0.03]
HEALTH - Composite measure ^a	-0.13 (0.94)	0.25 (1.07)	-0.20 (0.74)	0.16 (1.16)	0.38 [0.09]	0.37 [0.06]	0.01 [0.13]
Distance to nearest concrete road ^a	0.31 (0.27)	0.17 (0.27)	0.40 (0.36)	0.24 (0.30)	-0.14 [0.03]	-0.16 [0.03]	0.02 [0.05]
Number of schools	2.41 (1.27)	2.81 (1.35)	2.51 (1.54)	3.46 (2.30)	0.41 [0.13]	0.94 [0.14]	-0.53* [0.28]
Number of public toilets	0.28 (0.46)	1.65 (1.74)	0.53 (1.03)	2.40 (5.34)	1.35 [0.32]	1.88 [0.43]	-0.52 [0.84]
Number of bus and minibus trips	8.59 (8.05)	13.28 (13.72)	8.26 (9.91)	13.21 (14.62)	4.69 [1.14]	4.95 [0.69]	-0.26 [1.42]
Household pipeline or toilet connection	-0.28 (0.17)	0.12 (0.39)	-0.28 (0.15)	0.33 (1.02)	0.40 [0.06]	0.61 [0.10]	-0.21 [0.18]
STREETLIGHTS - Composite measure	-0.39 (0.80)	0.14 (0.88)	-0.32 (0.71)	0.39 (1.15)	0.53 [0.06]	0.72 [0.06]	-0.19 [0.12]

Notes: Standard Deviations are given in (parentheses).

Standard Errors are given in [brackets].

*** p<.01, ** p<.05, * p<.10.

Public goods measures are taken at the GP level; the number of observations per time period is 144 unless otherwise noted.

^a These measures included 143 GPs due to missing data in one GP.

A t-test of the difference in 1991 means between reserved and unreserved villages shows no statistically significant difference for any of the above measures.

Results

Despite gender-specific differences in preference for public goods, we do not find a significant difference in the provision of public goods by male and reserved-female GP presidents. Overall, the basic DID estimation shows that women in reserved GPs perform very similarly to men, and we do not see strong evidence of women providing public goods in accordance with their preferences. Even more interestingly, women do not provide fewer public goods than their male counterparts, despite their apparently poorer knowledge of the GP. One exception is in provision of schools, where we see significantly lower provision in women-reserved GPs. This, however, is consistent with the observation that women have a lower preference for schools compared to men.

These results are robust to controlling for other factors. Table 9 shows the results of a DID estimation with covariates added; these are the results of a regression of the form

$$y = \alpha + \beta_1 \text{RESERVED} + \beta_2 2005 + \beta_3 (\text{RESERVED} \cdot 2005) + \beta_4 \mathbf{X} + \varepsilon, \quad (6)$$

where \mathbf{X} is a vector of covariates containing the following: GP female and SC population ratios in 1991, GP total population in 1991, GP total population of children six years or younger in 1991, a dummy variable indicating the president's membership in the AIADMK political party¹⁹ in 2005, the number of villages that comprise the GP, total cultivated land area of the GP in 1991, and block-level control variables that allow for different trends in the 12 blocks in our sample.

The results—in terms of the treatment effect of having a woman president in a reserved seat—are largely unchanged. Table 9 shows that the additional covariates do not change the fact that public goods provision in GPs is largely consistent between male and female presidents.²⁰ One significant difference does emerge, namely that household water and toilet connections are fewer in women-reserved GPs. However, this is only one of the nine outcome measures examined, and household toilet and water connections are a relatively low-ranked priority among both men and women. Thus, the main observation still holds, i.e. that public goods provision is generally consistent between the male and female presidents.

Furthermore, we find that (i) membership in the AIADMK political party and (ii) a greater number of villages comprising the GP are both correlated with higher public goods provision. Affiliation with AIADMK is associated with higher provision of health (proxied by data on children's immunizations), bus and minibus trips, and streetlight provision and maintenance.

This is not surprising, considering that a president who has a good relationship with higher-level officials can often steer funds and projects towards his or her GP. We also see that for five of the nine measures of public goods (borewells, health, schools, household water/pipeline connections, streetlight provision and maintenance) a larger number of villages in the GP is associated with greater provision. Note that the neither the number of villages in the GP nor membership in the AIADMK differs significantly between male and reserved-female presidents.²¹

¹⁹ The party in power at the state level in Tamil Nadu generally alternates between the DMK (Dravida Munnetra Kazhagam) and the AIADMK (All India Anna Dravida Munnetra Kazhagam) parties. In 2005, the AIADMK was in power from the 2001 elections. Note that, at the GP-level elections, the de jure rules state that candidates are prohibited from running on a political party. However, de facto their party affiliation does indeed play a role.

²⁰ Other model specifications using covariates in the DID estimation are given in Appendix Tables A1-A3. The results do not change overall.

²¹ Fifty-nine and 65 percent of male and reserved-female presidents, respectively, belonged to the AIADMK party in 2005; a t-test of whether this difference is significantly different from zero yields a p-value of 0.58. In terms of the number of villages in a given GP, women-reserved GPs comprise 6.1 villages on average, versus 6.4 for unreserved GPs ($p = 0.69$).

Table 9. DID estimation with controls for GPs reserved and unreserved for female presidents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public Toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
Woman	-0.636	-0.0724	0.0229	0.0503	-0.489	-0.529	-1.275	-0.307**	-0.265
Reservation*2005	(1.19)	(0.058)	(0.25)	(0.090)	(0.46)	(1.01)	(3.44)	(0.15)	(0.24)
Woman Reservation	-0.0333	0.0238	0.0888	-0.0866	-0.219	-0.236	0.225	0.000847	-0.0607
	(0.82)	(0.040)	(0.17)	(0.063)	(0.32)	(0.69)	(2.38)	(0.10)	(0.17)
2005	-17.83	-0.501	8.608***	0.880	-12.07**	8.696	-60.05	-2.371	-5.056*
	(14.6)	(0.72)	(3.07)	(1.13)	(5.69)	(12.4)	(42.5)	(1.79)	(2.99)
1991 Female	15.69	1.538	0.661	-0.745	0.875	-5.382	58.21	4.062	2.357
Population Ratio	(24.6)	(1.20)	(5.17)	(1.89)	(9.58)	(20.8)	(71.4)	(3.01)	(5.02)
1991 SC Population	-0.172	-0.0846	-0.140	0.177	1.301	-2.010	-7.756	0.0293	0.304
Ratio	(2.82)	(0.14)	(0.59)	(0.22)	(1.10)	(2.38)	(8.18)	(0.34)	(0.58)
# Villages in GP	0.167**	-0.0000991	0.0398**	0.0000940	0.165***	0.0353	0.163	0.0830***	0.0892***
	(0.082)	(0.0040)	(0.017)	(0.0063)	(0.032)	(0.070)	(0.24)	(0.010)	(0.017)
AIADMK Party	-0.0753	0.0272	0.425***	-0.0467	-0.0653	-0.560	3.718*	0.0776	0.378**
	(0.76)	(0.037)	(0.16)	(0.058)	(0.29)	(0.65)	(2.19)	(0.092)	(0.15)
LN 1991 GP	1.977	0.0176	-1.129***	-0.103	1.376**	-0.982	1.202	0.185	0.536*
Population	(1.51)	(0.074)	(0.32)	(0.12)	(0.59)	(1.29)	(4.39)	(0.18)	(0.31)
LN 1991 GP	-1.056	-0.00314	0.122	0.0478	0.232	2.100*	2.796	-0.0175	0.0733
Population < 6	(1.38)	(0.067)	(0.29)	(0.10)	(0.53)	(1.17)	(3.99)	(0.17)	(0.28)
LN Total Cultivated	0.700	-0.0127	-0.108	-0.0407	-0.0870	-0.941*	2.014	-0.0302	-0.0610
Land 1991	(0.60)	(0.030)	(0.13)	(0.046)	(0.23)	(0.51)	(1.75)	(0.074)	(0.12)
Vellore District	-1.759	-0.316***	0.306	0.281***	0.0195	-2.298**	-9.388***	-0.936***	-0.685***
	(1.14)	(0.056)	(0.24)	(0.087)	(0.44)	(0.96)	(3.30)	(0.14)	(0.23)
Pudukottai District	-5.602***	-0.509***	-0.960***	0.137	0.0211	0.0487	-5.547*	-1.164***	-0.334
	(1.10)	(0.054)	(0.23)	(0.085)	(0.43)	(0.94)	(3.20)	(0.13)	(0.23)
Constant	2.969***	0.225***	-0.202**	0.401***	2.509***	0.527	8.259***	-0.283***	-0.322***
	(0.38)	(0.019)	(0.081)	(0.029)	(0.15)	(0.32)	(1.11)	(0.047)	(0.078)
Observations	286	286	282	283	285	285	286	286	286
R-squared	0.29	0.35	0.31	0.17	0.32	0.12	0.15	0.54	0.34

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in parentheses; *** p<0.01, ** p<0.05, * p<0.1..

Discussion

Thus far, we have brought together some very interesting phenomena, as follows:

1. Women and men in Tamil Nadu's villages have different preferences for public goods.
2. Female presidents under-perform relative to their male counterparts on a test of GP knowledge. When comparing women and SC persons, female presidents also performed worse than SC presidents.
3. Female presidents in reserved GPs generally provide the same amount of public goods as men. They do not generally provide public goods in accordance with the preference of women in the villages of Tamil Nadu. This is consistent with the findings of Ban and Rao (2008) but contrary to the findings of Chattopadhyay and Duflo (2004).

As Tamil Nadu is a leader in India in terms of women's empowerment, we might expect that, in light of the findings of Chattopadhyay and Duflo, female presidents in the reserved GPs of Tamil Nadu would provide more female-preferred goods. Alternatively, we might expect women to provide fewer public goods compared to men, due to their apparent lack of knowledge regarding the GP. However, we do not find either to be true. Instead, we find that women in reserved GPs perform very similarly to men, in terms of public goods provision.

We explain the similar performance of women and men in Tamil Nadu's GPs using the observations of: (i) women's very low scores on the knowledge test, and (ii) the fact that 80 percent of the women in our sample told the survey interviewers that they were being influenced by their husbands while in office.

If the knowledge test is an accurate measure of a president's ability, then the test results indicate that women are of lower ability, and we would expect to see lower public goods provision in female-reserved GPs. However, using an argument similar to that of Basu and Foster (1998),²² we hypothesize that women in reserved GPs acquire ability from their husbands. Given women's low scores on the GP knowledge test, they may turn to the men in their households for help while in office. This acquisition of knowledge and assistance (for example, help with filling out paperwork or applying for funding through one of the many government public goods schemes) may allow the men to influence the women in favor of more male-preferred public goods. This could explain the similar performances of male and female presidents; the women are not providing fewer public goods (as might be suggested by the lower test scores) because they are being helped by men. At the same time, they are not providing public goods in accordance with their preferences (as suggested by the findings of Chattopadhyay and Duflo) because they are being influenced by the men's preferences. Alternatively (or in addition), it is possible that male and female presidents simply provide to the average preference in Tamil Nadu's villages, in which case we would not see very different provision between the sexes. However, even if this is the case, we would still expect to see lower provision in women-reserved GPs, given the lower test scores of female presidents and our supposition that the test reflects ability.

It is also possible that the test score is not a good measure of ability, and good test performance is not required for a president to be capable of providing public goods. However, we argue that the lower test scores are still indicative of something. The knowledge test, consisting of basic questions about the GP, was given to presidents in the fourth year of their presidencies. If a sitting president is truly active in the position, he/she should be able to answer more than half of the questions correctly. The very poor results of female presidents on this test at the very least indicate a lack of interest and/or activity while in

²² Basu and Foster (1998) claim that the 'proximate literacy' rate of a country is a more important measure of literacy than the actual literacy rate. They conclude that an illiterate person living in a household with a literate person is much better off than an illiterate person with no literates in the household. This is due to the positive externality of having at least one literate person around, capable of reading and providing information to the illiterate person. Such a person is called a 'proximate literate,' as compared to an 'isolated illiterate.'

office. Therefore, if a low test score indicates a lack of participation in GP activities by the president, we would again expect to see lower public goods provision by presidents with lower test scores (i.e., women in reserved GPs), and we do not observe this. Therefore, this again supports our hypothesis that the reserved-women presidents were helped or influenced by men, resulting in similar levels of public goods provision.

Furthermore, Table 10 shows that reserved-female presidents have significantly less contact with higher-level officials. In order to get funds or projects for a GP, the president must be in contact with higher-level officials in order to apply for funds through government schemes administered at the Block or District levels. Indeed, our field researchers reported anecdotal evidence suggesting that it is very important for a president to have a good relationship with these officials. The significantly lower contact between reserved-female presidents and higher-level officials provides further support for the notion that men may very well be involved in women's presidencies. This would seem to explain how women and men perform similarly while in office, even though the women have much less contact with officials.

Table 10. Reserved-female presidents' contact with higher-level panchayat officials

	Contact with the Block Development Officer			Contact with the Panchayat Union Chairman			Contact with the District Panchayat Chairman		
Woman Reservation	-0.225** (0.10)	-0.380*** (0.09)		-0.344*** (0.12)	-0.527*** (0.09)		-0.122* (0.07)	-0.188*** (0.06)	
Test score	0.047*** (0.01)	0.060*** (0.01)		.084*** (0.02)	0.099*** (0.02)		0.036*** (0.01)	0.043*** (0.01)	
Constant	-1.257 (0.89)	1.721*** (0.26)	-2.319*** (0.78)	-3.445*** (1.06)	1.653*** (0.26)	-4.693*** (1.00)	-3.760*** (1.04)	-1.099*** (0.22)	-4.294*** (0.97)
Observations	144	144	144	144	144	144	144	144	144

Notes: Observations are at the GP level in 2005.

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

The values listed for the "Women Reservation" and "Test Score" variables are the marginal effects estimated using the coefficients obtained from fitting a logistic regression to the data, which give the change in the probability of having high contact with the official as the independent variable changes.

"Contact with the..." refers to the *frequency* of contact between the GP president and the listed official. In the case of the Block Development Officer, the dependent variable for contact equals 0 (low contact) if the president answered that contact happened "never," "rarely," or "sometimes," and equals 1 (high contact) if the president answered "frequently." In the case of the Panchayat Union Chairman and the District Panchayat Chairman, the dependent variable for contact equals 0 (low contact) if the president answered "never" or "rarely," and equals 1 (high contact) if the president answered "sometimes" or "frequently."

Ban and Rao (2008) find that only 20 percent of reserved-women GP presidents indicate that they ran for office because of their spouses. Based on this, the authors conclude that women are not serving as tokens for their husbands. This is a problematic conclusion for two reasons. First, there is surely some error in a woman's self-reporting of whether her spouse urged her to run for office. Second, this question captures only the effect of a spouse urging a woman to run for office, yet this is only one of many ways a president may be influenced by a spouse. Even if a woman runs for office due to her own motivation, her spouse will have other opportunities to influence or at least participate in her presidency. Third, and perhaps most importantly, the responses are aggregated across four states in Ban and Rao, meaning that state-specific differences in spousal influence are not captured. State-specific studies are important in contexts such as these, because they allow us to better understand and appreciate the different cultural settings and experiences of states, especially in a country as diverse as India.

The fact that female presidents are not providing fewer public goods while in office would seem to support India's reservation policies, which encourage the active participation of women in governance. Our results, however, do suggest some policy changes. In particular, this analysis shows that although women and men provide similar levels of public goods while in office, women score far lower on GP knowledge. Increased or more targeted training for female presidents may help them improve their performance of official duties. Indeed, many of the female presidents interviewed for this study complained that training was given either too late or not at all, and that they were given an overwhelmingly large amount of paperwork to read and understand. This seems to suggest that more timely and adequate training for female presidents may further support their role in Indian governance.

Panchayat Reservation for the Scheduled Caste

Next, we analyze Scheduled Caste presidents in Tamil Nadu and their public goods provision. SC persons comprise approximately 19 percent of Tamil Nadu's population; this is reflected in the 20 percent of GP presidential seats that are reserved for SC persons. In our data set, 25 GPs are reserved for SC-persons, two of which failed to comply with the reservation, for a total of 23 GPs reserved for SC persons. The SC presidents are 44 years of age on average (ranging from 35 to 60), and 64 percent cite farming as their primary occupation. Forty-four percent of the SC presidents in SC-reserved GPs state that previous community work motivated them to run for office, two percent cite the reservation as their motivation, and 24 percent say that they ran for "other" reasons.

SC persons in Tamil Nadu have a literacy rate of 63.2 percent, lower than the 75.9 percent rate among non-SC persons in Tamil Nadu. Additionally, they have lower educational levels than their non-SC president counterparts; only 48 percent of the SC presidents in our sample had education through high school or beyond, compared to 69 percent of non-SC persons. Thus, it is not surprising that the GP knowledge of SC presidents is lower than that of non-SC presidents, as reflected in their scores on the GP knowledge test. Notably, however, the SC presidents score higher on the test than women presidents in reserved GPs (Table 5).

In this next part of our analysis, we focus on the GP president and the role of caste on public goods provision. More specifically, we examine: (i) if SC and non-SC presidents have different preferences for public goods, and (ii) if SC presidents have different provision of public goods compared to non-SC presidents.

Preferences

Using the same data as in the gender comparison described above, we estimate SC and non-SC preferences for public goods. We then compare the means of different measures of public goods provision in reserved and non-reserved villages. Comparable to Table 6 for the case of males versus females, Table 11 lists the percentage of SC and non-SC individuals giving the listed answer for at least one of their top three responses.

From Table 11, we see that SC persons cite the need for health care/hospitals and group housing significantly more often than non-SC persons, and a greater need for drinking water, though this is not significant at 10 percent. Non-SC persons, on the other hand, cite a need for school/education and sanitation significantly more than do SC persons.

Table 11. Preferences for infrastructure, by caste (percent of group with response in top 3)

Response	Mean, non-SC	Mean, SC	Difference
Drinking water	0.4603	0.5556	-0.0952 <i>0.119</i>
Health/Hospital	0.3730	0.4861	-0.1131* <i>0.0617</i>
Roads	0.3413	0.3125	0.0288 <i>0.6164</i>
School/Education	0.3095	0.2014	0.1081** <i>0.0413</i>
Sanitation	0.2698	0.1528	0.1171** <i>0.0179</i>
Drainage	0.2619	0.2083	0.0535715 <i>0.3009</i>
Bus and road	0.1508	0.1944	-0.0436507 <i>0.3472</i>
Group houses	0.0159	0.1944	-0.1786*** <i>0.000</i>
Individual pipeline or toilet connection	0.0952	0.0764	0.0188 <i>0.582</i>
Streetlights	0.0714	0.0972	-0.0258 <i>0.451</i>

Notes: - P-values are given in italics.

- Significant at ***1%, **5%, and *10%.

Provision

Analogous to our analysis of female-reserved and unreserved GPs in the previous section, we next test whether the differences in preferences for public goods by SC and non-SC persons are reflected in the provision of public goods by GP presidents of each type (Table 12). We again use a DID estimation strategy; however, in this case we need to be concerned with endogeneity in GP selection for SC reservation. SC villages were shown earlier to have smaller populations and greater SC populations compared to unreserved villages. Therefore, we also test the robustness of the DID estimation results by using a matching estimation strategy.

Table 12. DID estimation without controls for GPs reserved and unreserved for SC presidents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Reserved for SC</i>		<i>Unreserved GPs</i>		<i>Time Period Difference</i>		DID Estimator
	Mean 1991	Mean 2005	Mean 1991	Mean 2005	Reserved	Unreserved	
Number of borewells	2.59 (3.20)	6.63 (7.62)	3.09 (3.00)	5.76 (5.16)	4.04 [1.17]	2.67 [0.26]	1.37* [0.78]
Distance to nearest borewell	0.23 (0.20)	0.30 (0.42)	0.23 (0.23)	0.21 (0.21)	0.07 [0.07]	-0.02 [0.01]	0.09** [0.04]
HEALTH - Composite Measure ^a	-0.13 (0.64)	0.29 (1.03)	-0.20 (0.82)	0.16 (1.16)	0.42 [0.13]	0.36 [0.06]	0.06 [0.15]
Distance to nearest concrete road ^a	0.33 (0.32)	0.26 (0.34)	0.39 (0.35)	0.21 (0.29)	-0.07 [0.04]	-0.18 [0.02]	0.11* [0.06]
Number of schools	2.17 (1.23)	2.83 (2.12)	2.55 (1.52)	3.41 (2.14)	0.65 [0.36]	0.85 [0.12]	-0.20 [0.32]
Number of public toilets	0.35 (0.49)	1.43 (0.95)	0.50 (1.00)	2.39 (5.22)	1.09 [0.20]	1.89 [0.41]	-0.80 [0.94]
Number of bus and minibus trips	7.78 (10.37)	11.48 (14.11)	8.44 (9.37)	13.55 (14.46)	3.70 [1.14]	5.12 [0.67]	-1.42 [1.61]
Household pipeline or toilet connection	-0.31 (0.08)	0.20 (0.68)	-0.28 (0.16)	0.30 (0.96)	0.51 [0.14]	0.58 [0.09]	-0.06 [0.21]
STREETLIGHTS - Composite measure	-0.50 (0.48)	0.01 (0.68)	-0.31 (0.77)	0.40 (1.15)	0.51 [0.07]	0.70 [0.06]	-0.19 [0.13]

Notes: Standard Deviations are given in (parentheses).

Standard Errors are given in [brackets].

*** p<.01, ** p<.05, * p<.10.

Public goods measures are taken at the GP level; the number of observations per time period is 144 unless noted.

^a These measures included 143 GPs due to missing data in one GP.

A t-test of the difference in 1991 means between reserved and unreserved villages shows no statistically significant difference for any of the above measures.

Results

Similar to the case of men and women, we find that SC and non-SC persons have different preferences for public goods. We also find very interesting differences in the provisions of drinking water—in the form of borewells—and roads. Notably, SC presidents in SC-reserved GPs provide significantly more borewells than their counterparts, yet the distance to the nearest borewell is farther away from the village center in SC-reserved villages. How can we interpret this?

It is very common in rural Indian villages—and Tamil Nadu is no exception—that SC persons often live in isolated areas of the village. In our sample, the SC-inhabited areas are separated from the main village in 93 percent of villages. Therefore, our finding that SC-reserved villages have more borewells that are farther away from the village center suggests that new borewells are being dug in the SC-inhabited areas of the villages, which are farther away from the village center. This is consistent with the SC preference for drinking water as an important public good. This finding is consistent with the results of Besley et al. (2004), who observe that SC leaders tend to invest in certain public goods that favor the SC population.

In the case of roads, the story is less clear. With limited resources, the provision of other public goods, such as roads, may have to be sacrificed or delayed due to the SC presidents' greater investments

in borewells. Or, similar to the case of the borewells, it may be that the concrete roads are being built in the relatively isolated SC-inhabited areas. We are unable to speculate strongly on this matter because we have only one measure of roads.

Given the non-random nature of assigning SC reservations, combined with the large variance in SC population ratios within some blocks, it is particularly important to check that these results are robust to the addition of several covariates to the DID estimation. Accordingly, we repeat the regression with the addition of variables controlling for the following: GP female population ratio in 1991, GP SC population ratio in 1991, GP total population in 1991, GP total population of children six years or younger, a dummy variable indicating the president's membership in the AIADMK political party in 2005, the number of villages that comprise the GP, the total cultivated land area of the GP, and the block level.²³ The results are given in Table 13. Our interesting findings of provision and placement of borewells by SC presidents in reserved GPs are unchanged. Table 13 shows that SC-reserved GPs provide more borewells, and that these are located farther away from the city center.

Our results confirm the findings from the previous DID estimation in sign and magnitude, though the statistical significance of the differences is not strong. In the specification with controls, we also find that the measure of health care in the village is significantly lower in SC-reserved GPs. However, we believe our findings support our claim that SC presidents are by and large not providing less public goods than their non-SC counterparts, and are even providing more of one good (borewells) that they prefer. Additionally, a DID Propensity Score Matching (DID PSM) estimation procedure (see Appendix) finds similar results, in that SC-reserved GPs are found to have more borewells, located farther away. The DID PSM result agrees with the DID results in sign and magnitude, though not in statistical significance.

Similar to the case of reserved-female presidents, we see that the number of villages in a GP and a president's membership in AIADMK lead to greater public goods provision. While the number of villages per GP does not significantly differ between SC-reserved and unreserved GPs,²⁴ significantly more reserved-SC presidents compared to non-SC presidents are affiliated with AIADMK (83 and 56 percent, respectively).²⁵ The better political-connectedness that comes with membership in the power party may explain part of the success SC presidents have in supplying more borewells. Indeed, a regression of 'contact with higher level panchayat officials' on GP reservation status shows that reserved-SC and non-SC presidents are generally equally well-connected to higher-level politicians (Table 14).

²³ Propensity Score Matching (PSM) is also a suitable analysis for a robustness check of our results, although it is very similar to our DID estimation with covariates and tends to be a more controversial empirical method. The main difference between PSM and our DID estimation with covariates is that calculating the propensity score based on GP SC and female 1991 population ratios, GP total 1991 population, GP total 1991 population of children six years or younger, and total cultivated land area of the GP allows for a non-linear effect of these factors on public goods outcomes. When we perform a DID PSM estimation using all five of these variables to calculate the propensity score, the results are consistent with those from the DID estimation with covariates. The DID PSM estimation technique and results are given in the Appendix.

²⁴ SC-reserved GPs have 6.1 villages per GP on average, versus 6.4 for unreserved GPs, with a p-value of 0.80.

²⁵ This difference is significantly different from zero at a five percent level of significance.

Table 13. DID estimation with controls for gps reserved and unreserved for SC presidents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
SC Reservation*2005	1.825 (1.43)	0.110 (0.070)	-0.691** (0.30)	0.0189 (0.11)	-0.151 (0.56)	0.0589 (1.22)	1.093 (4.16)	-0.0712 (0.18)	-0.242 (0.29)
SC Reservation	-0.446 (0.92)	0.00344 (0.045)	0.0614 (0.19)	-0.0632 (0.070)	-0.343 (0.36)	-0.152 (0.78)	-0.626 (2.67)	-0.0335 (0.11)	-0.200 (0.19)
2005	-15.98 (14.3)	-0.372 (0.70)	8.423*** (2.97)	1.049 (1.11)	-9.349* (5.60)	11.37 (12.2)	-56.58 (41.6)	-1.236 (1.78)	-3.741 (2.92)
1991 SC Population Ratio	-1.996 (3.18)	-0.235 (0.16)	0.702 (0.66)	0.242 (0.25)	2.001 (1.25)	-1.850 (2.70)	-8.333 (9.24)	0.185 (0.39)	0.916 (0.65)
1991 Female Population Ratio	10.82 (23.7)	1.186 (1.16)	1.440 (4.93)	-1.043 (1.84)	-4.476 (9.30)	-10.83 (20.2)	50.40 (68.9)	1.766 (2.95)	-0.121 (4.84)
# Villages in GP	0.157* (0.083)	-0.000920 (0.0040)	0.0444** (0.017)	0.000435 (0.0063)	0.169*** (0.032)	0.0359 (0.070)	0.160 (0.24)	0.0839*** (0.010)	0.0926*** (0.017)
AIADMK Party	-0.193 (0.76)	0.0175 (0.037)	0.480*** (0.16)	-0.0432 (0.058)	-0.0194 (0.30)	-0.563 (0.65)	3.681* (2.21)	0.0879 (0.095)	0.418*** (0.16)
LN 1991 GP Population	2.069 (1.51)	0.0261 (0.074)	-1.196*** (0.31)	-0.114 (0.12)	1.223** (0.59)	-1.070 (1.29)	1.129 (4.40)	0.133 (0.19)	0.437 (0.31)
LN 1991 GP Population < 6	-1.004 (1.37)	0.000633 (0.067)	0.112 (0.29)	0.0497 (0.11)	0.279 (0.54)	2.131* (1.17)	2.871 (3.99)	0.00317 (0.17)	0.0941 (0.28)
LN Total Cultivated Land 1991	0.655 (0.60)	-0.0168 (0.029)	-0.0783 (0.13)	-0.0364 (0.046)	-0.0241 (0.24)	-0.900* (0.51)	2.040 (1.76)	-0.00915 (0.075)	-0.0197 (0.12)
Vellore District	-1.757 (1.13)	-0.317*** (0.055)	0.332 (0.24)	0.289*** (0.087)	0.153 (0.44)	-2.189** (0.96)	-9.271*** (3.29)	-0.886*** (0.14)	-0.610*** (0.23)
Pudukottai District	-5.528*** (1.09)	-0.504*** (0.053)	-0.960*** (0.23)	0.146* (0.084)	0.163 (0.43)	0.171 (0.93)	-5.376* (3.17)	-1.106*** (0.14)	-0.262 (0.22)
Constant	3.033*** (0.37)	0.229*** (0.018)	-0.192** (0.078)	0.392*** (0.028)	2.517*** (0.14)	0.500 (0.31)	8.408*** (1.07)	-0.278*** (0.046)	-0.303*** (0.075)
Observations	286	286	282	283	285	285	286	286	286
R-squared	0.29	0.35	0.32	0.17	0.32	0.12	0.15	0.53	0.34

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 14. Reserved-SC presidents' contact with higher-level panchayat officials

	Contact with the Block Development Officer			Contact with the Panchayat Union Chairman			Contact with the District Panchayat Chairman		
SC	.066	00.022		-0.091	-0.135		-0.028	-0.041	
Reservation	(0.08)	(0.09)		(0.12)	(0.11)		(0.08)	(0.09)	
Test Score	0.061***		0.060***	0.098***		0.099***	0.043***		0.043***
	(0.01)		(0.01)	(0.02)		(0.02)	(0.01)		(0.01)
Constant	-2.473***	1.154***	-2.319***	-4.592***	1.066***	-4.693***	-4.264***	-1.296***	-4.294***
	(0.81)	(0.21)	(0.78)	(1.01)	(0.21)	(1.00)	(0.98)	(0.22)	(0.97)
Observations	144	144	144	144	144	144	144	144	144

Notes: Observations are at the GP level in 2005.

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The values listed for the "SC Reservation" and "Test Score" variables are the marginal effects estimated using the coefficients obtained from fitting a logistic regression to the data, which give the change in the probability of having high contact with the official as the independent variable changes.

"Contact with the..." refers to the *frequency* of contact between the GP president and the listed official. In the case of the Block Development Officer, the dependent variable for contact equals 0 (low contact) if the president answered that contact happened "never," "rarely," or "sometimes," and equals 1 (high contact) if the president answered "frequently." In the case of the Panchayat Union Chairman and the District Panchayat Chairman, the dependent variable for contact equals 0 (low contact) if the president answered "never" or "rarely," and equals 1 (high contact) if the president answered "sometimes" or "frequently."

Discussion

SC presidents in SC-reserved GPs behave similarly to their non-SC counterparts in provision of nearly all public goods, with the major exception of borewells, an important source of potable water in rural India. The results of the simple DID estimation show that SC-reserved villages have more borewells, but that they are located on average farther away from the village center. This strongly suggests that SC presidents favor the SC-inhabited areas (i.e. isolated areas) for the locations of borewells. These results hold in sign and magnitude—though not strongly in statistical significance—when we correct for the non-random reservation process using DID estimation including covariates.

This is a surprising and exciting result. Our finding that SC presidents do not generally provide fewer public goods—despite having lower scores on the knowledge test and less experience in office—is encouraging in light of India's reservation policies. Furthermore, our preliminary results suggesting that SC presidents provide more borewells to isolated SC-inhabited village areas is a real-world example of one of the oft-cited benefits of decentralization. In this case, government leaders at the local level have better knowledge of where and what public goods are most needed. Indeed, the SC-inhabited areas of villages tend to be the poorest in terms of people and infrastructure.

SC presidents do not lean towards their preferences regarding the provision of other public goods, but this is not too surprising if we believe the median voter theorem. In all but four of the villages studied herein, SC persons comprise the minority of the village population. Therefore, despite their different preferences, SC presidents may be responding to the preferences of the median voters (i.e. non-SC persons) when making most decisions regarding public goods. However, in the case of their most preferred good—drinking water access—they seem to favor SC persons and SC-inhabited areas.

6. CONCLUDING COMMENTS

This paper explores gram panchayats in Tamil Nadu state in India, in order to better understand the influence of a GP president's gender and caste on village public goods provision. We find that gender generally does not influence public goods outcomes—male and female presidents perform similarly overall. On the other hand, while we find that SC presidents also provide most public goods in line with their non-SC counterparts, SC presidents provide more drinking water access, and locate these access points more often in isolated SC-inhabited areas. The strong evidence that neither women nor SC presidents provide fewer public goods than their counterparts is encouraging. However, we find that the female presidents: (i) have lower knowledge of the GP; (ii) have little contact with higher-level panchayat officials; and (iii) anecdotally indicate that they are influenced by their husbands. The empirical evidence that reserved-women are not performing differently from men suggest that men may be involved in women's presidencies. Therefore, better training programs aimed at increasing the knowledge and understanding of the village governments could be especially beneficial for female presidents.

In the present paper, we extend and build upon previous studies by including data from two time periods for many measures of public goods at the village level. Additionally, we include data from three districts in one state, and from three different levels of development, giving us a rich understanding of what is happening at the GP level in Tamil Nadu. Given the extremely diverse nature of India and her states, we can expect the effects of the panchayat system and the mandatory reservations to vary, making in-depth, state-specific studies—such as this one— invaluable.

APPENDIX

A.1. Errors in the Selection of GPs for Reservation

The selection of GPs for reservation for women and SC persons is outlined in Section 2. However, this selection process exhibited errors. GPs below the threshold level of SC and female population ratios were mistakenly selected for reservation, and GPs above the threshold were mistakenly not selected for reservation. For each of the 12 blocks in our sample, the reservations and errors are shown in Figures 3-8. All reserved GPs (indicated by a value of '1' on the vertical axis) should be located to the right of the threshold marking, while all GPs to the left of the threshold marking should be unreserved (indicated by a value of '0' on the vertical axis). The error rate (calculated as reserved GPs that should not have been reserved) is 27.3 percent for women-reserved GPs and 39.1 percent for SC-reserved GPs.

Figure A.1. Coimbatore District (Women)

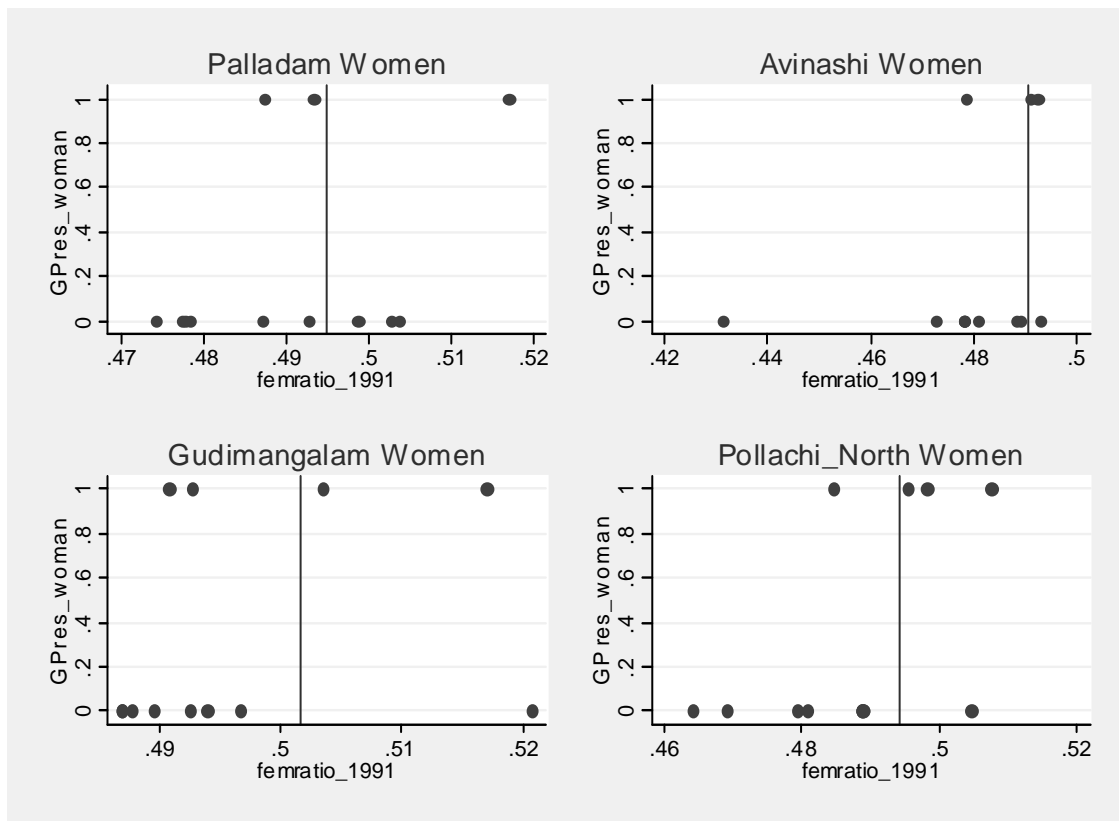


Figure A.2. Pudukottai District (Women)

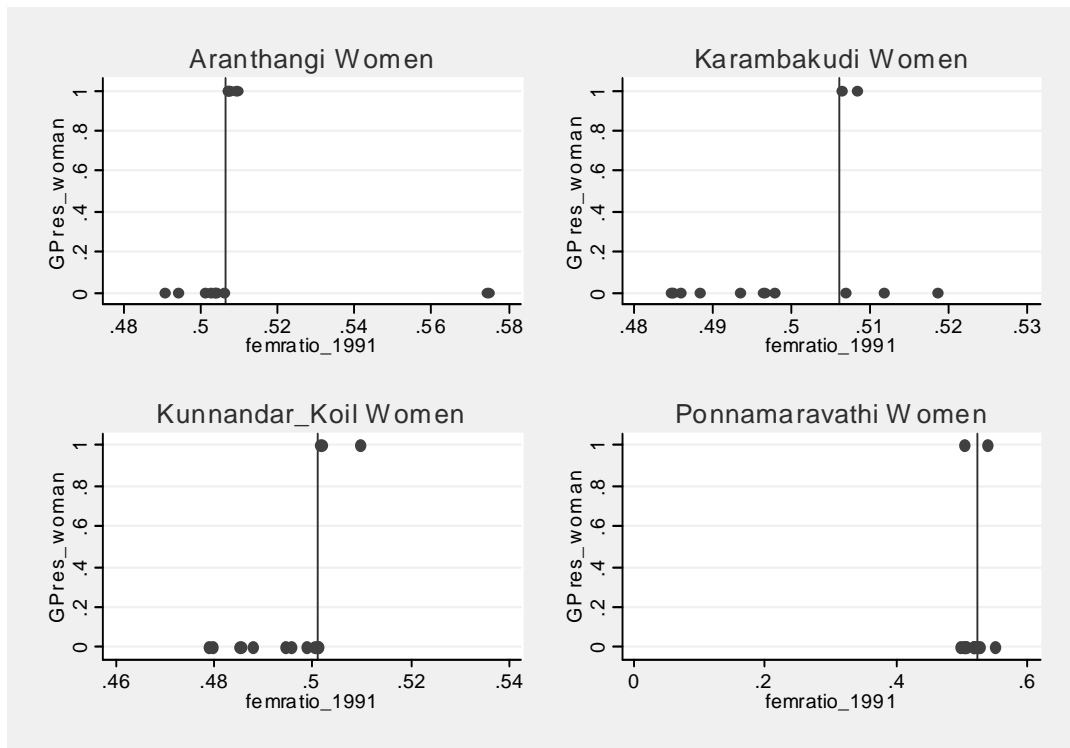


Figure A.3. Vellore District (Women)

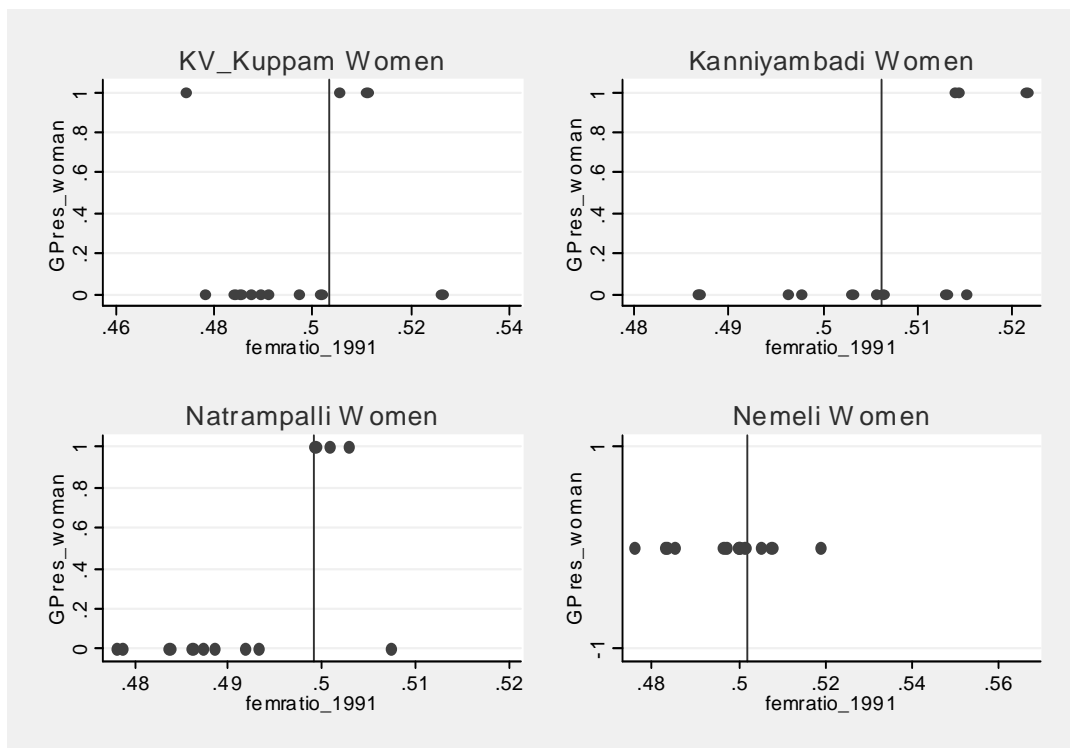


Figure A.4. Coimbatore District (SC)

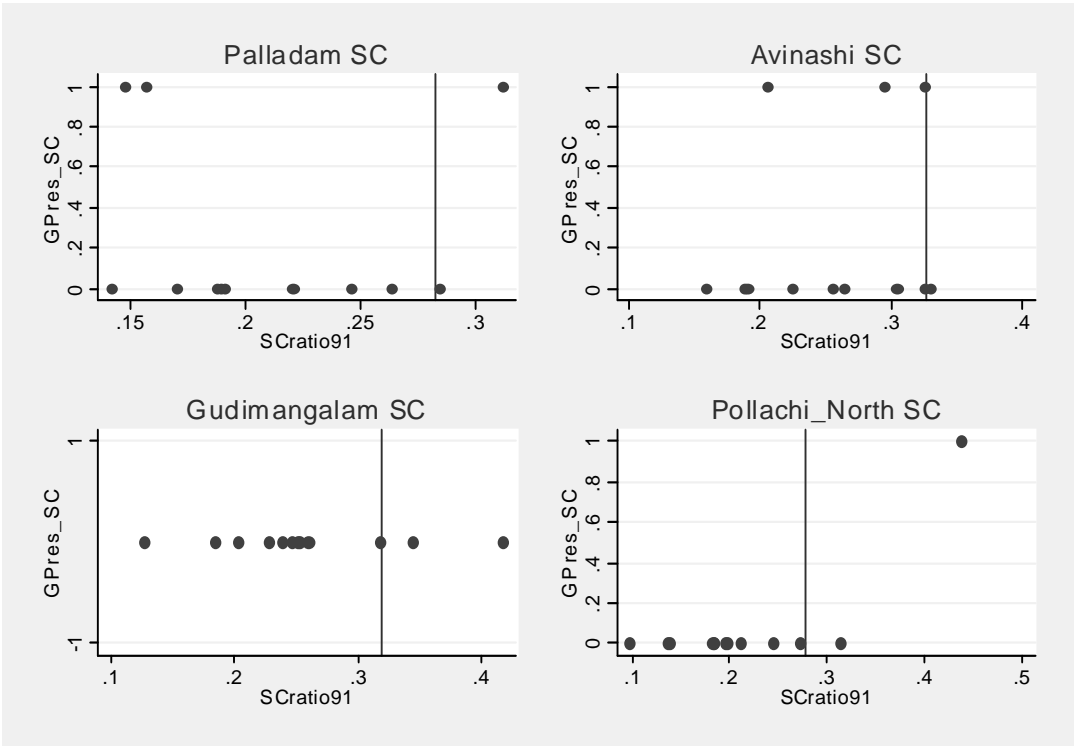


Figure A.5. Pudukottai District (SC)

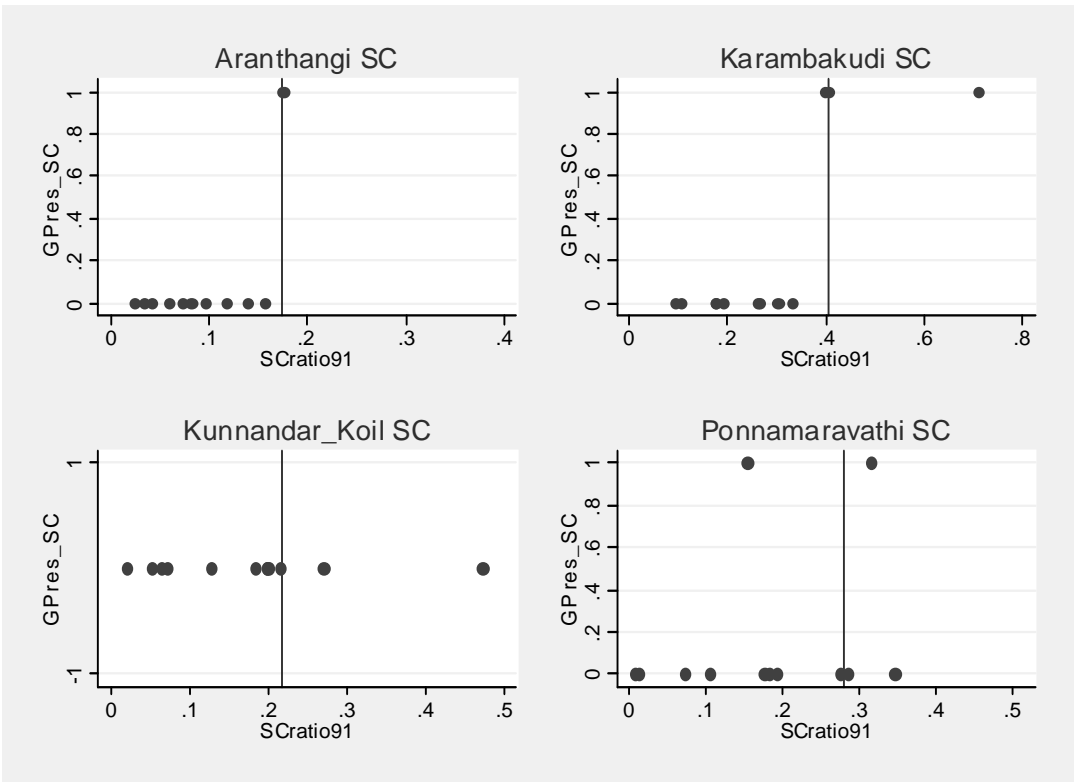
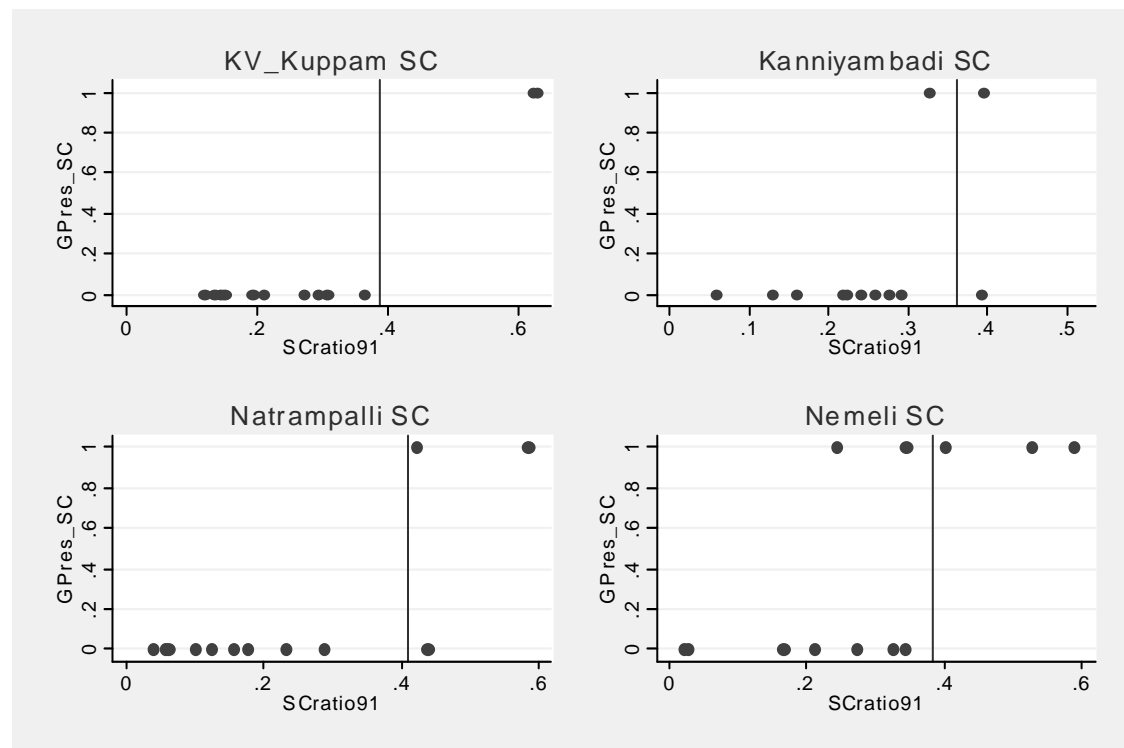


Figure A.6. Vellore District (SC)



To ensure that the GPs selected (or not selected) in error do not contain systematic differences that might affect public goods provision, we compare village characteristics and public goods levels in 1991 between GPs with and without errors in their reservation status. As shown in Tables 15 and 16, among GPs with and without errors in their SC reservation status, no statistically significant differences were found in village or public goods characteristics, except for the number of schools in the GP in 1991. We do not see this as a cause for concern, nor do we consider it to be strong evidence that unobserved factors affecting errors in SC reservation assignment may influence public goods provision. In Tables 17 and 18, we see statistically significant differences in GP population measures between GPs with and without errors in women's reservations. The results show that, in GPs where the women's reservation had an error, the ratio of females in the population is higher, the GP has more children, and there are fewer Muslim and Christian households. Again, we do not see this as a cause for concern when examining the effect of the reservation policy. The higher female population ratio is simply due to the fact that, in our sample, the majority of errors in women's reservation occurred when GPs that should have been reserved (i.e. those having a high female population ratio) were not. The number of GPs with this error (25) is much larger than the number of GPs that were reserved that should not have been (9). Therefore, the GPs with errors necessarily have higher female population ratios. This may explain why there are more children in those GPs as well. The finding that there are fewer Muslim and Christian households in GPs with errors for women's reservations is interesting. However, as a proportion of the total households in the sampled GPs, Muslim households comprise about three percent of total households and Christian households comprise less than two percent. Having a difference among such a small proportion of the total households does not strongly suggest evidence of a systematic cause for errors in women's reservations.

Table A.1. Differences in village characteristics in 1991: GPs with and without errors in reservation status for SC presidents

Variable	Mean, GPs with no errors	Mean, GPs with errors	Difference
Village population - total	2660.921	2258.556	402.3651 <i>0.2516</i>
Village population - under six years of age	325.6429	256.5556	69.0873 <i>0.1589</i>
Ratio of females to total population	0.4961983	0.5016464	-.0054481 <i>0.1911</i>
Backward Caste (BC) population	739.881	1089.556	-349.6746 <i>0.2834</i>
Scheduled Caste (SC) population	551.619	642.9444	-91.3254 <i>0.355</i>
Households total	597.2619	542.7778	54.48413 <i>0.5207</i>
Hindu households	566.8413	525.2778	41.56349 <i>0.6199</i>
Muslim households	19.53968	11.66667	7.873016 <i>0.2001</i>
Christian households	10.88095	5.833333	5.047619 <i>0.2003</i>
Farm households	327.1429	313.3889	13.754 <i>0.7948</i>
Village citizens working in village	562.8968	527.7222	35.1746 <i>0.7415</i>
Female village citizens working in village	258.119	237.5556	20.5634 <i>0.6829</i>
Total cultivated land (acres)	2140.898	2733.781	-592.8824 <i>0.1625</i>
Literates	1231.159	1056.167	174.9921 <i>0.3509</i>

Notes: - P-values are given in italics.

- Indicates significance at *10%, **5%, ***1%.

Table A.2. Differences in public goods in 1991: GPs with and without errors in reservation status for SC presidents

Variable	Mean, GPs with no errors	Mean, GPs with errors	Difference
Number of borewells	2.972222	3.277778	-0.305556 <i>0.6903</i>
Distance to nearest borewell	0.2234127	0.2888889	-0.0654762 <i>0.244</i>
HEALTH - Composite measure	-0.1756144	-0.2528674	0.077253 <i>0.6994</i>
Distance to nearest concrete road	0.379032	0.3972222	-0.0181902 <i>0.8355</i>
Number of schools	2.563492	1.944444	0.619048* <i>0.0975</i>
Number of public toilets	0.4920635	0.3333333	0.1587302 <i>0.5039</i>
Number of bus and minibus trips	7.888889	11.44444	-3.555551 <i>0.1381</i>
Household pipeline or toilet connection	-0.2770827	-0.3294424	0.0523597 <i>0.1679</i>
STREETLIGHTS - Composite measure	-0.3305746	-0.3797159	0.0491413 <i>0.7911</i>

- P-values are given in italics.

- Indicates significance at *10%, **5%, ***1%.

Table A.3. Differences in village characteristics in 1991: GPS with and without errors in reservation status for female presidents

Variable	Mean, GPs with no Errors	Mean, GPs with Errors	Difference
Village population – total	2733.555	2212.912	520.6428* <i>0.0557</i>
Village population - under six years of age	336.0727	255.3235	80.7492** <i>0.0337</i>
Ratio of females to total population	0.4936764	0.5072417	-.0135653*** <i>0.0000</i>
Backward Caste (BC) population	770.4364	826.1471	-55.7107 <i>0.8266</i>
Scheduled Caste (SC) population	556.7636	583.3235	-26.55989 <i>0.7301</i>
Households total	613.7	515.2353	98.46471 <i>0.1348</i>
Hindu households	580.7545	499.8235	80.93102 <i>0.2138</i>
Muslim households	21.04545	10.5	10.54545** <i>0.0267</i>
Christian households	11.9	4.911765	6.988235** <i>0.0219</i>
Farm households	335.0273	294.3529	40.67433 <i>0.3226</i>
Village citizens working in village	558.9273	557.1176	1.809626 <i>0.9826</i>
Female village citizens working in village	252.1273	266.6176	-14.49037 <i>0.7117</i>
Total cultivated land (acres)	2125.075	2505.969	-380.8941 <i>0.2497</i>
Literates	1262.855	1035.971	226.884 <i>0.1194</i>

Notes:- P-values are given in italics.

- Indicates significance at *10%, **5%, ***1%.

Table A.4. Differences in public goods in 1991: GPs with and without errors in reservation status for female presidents

Variable	Mean, GPs with no errors	Mean, GPs with errors	Difference
Number of borewells	2.977273	3.117647	-0.140374 <i>0.8142</i>
Distance to nearest borewell	0.2322727	0.2294118	0.0028609 <i>0.948</i>
HEALTH - Composite measure	-0.2126313	-0.1000188	-0.1126125 <i>0.4703</i>
Distance to nearest concrete road	0.3916055	0.3483529	0.0432526 <i>0.526</i>
Number of schools	2.509091	2.411765	0.097326 <i>0.7391</i>
Number of public toilets	0.5272727	0.2941176	0.2331551 <i>0.2065</i>
Number of bus and minibus trips	8.245455	8.617647	-0.372192 <i>0.8426</i>
Household pipeline or toilet connection	-0.2751652	-0.3110063	0.0358411 <i>0.2258</i>
STREETLIGHTS - Composite measure	-0.3512709	-0.289632	-0.0616389 <i>0.6696</i>

- P-values are given in italics.

- Indicates significance at *10%, **5%, ***1%.

A.2. Other Model Specifications for DID with Covariates

Tables 19-22 show various specifications of DID estimation with controls in women-reserved GPs, while Tables 24-27 show various specifications of DID estimation with controls in SC-reserved GPs. The results are consistent with the model specifications discussed in the main text. One item of interest is that Tables 23 and 28 include a dummy variable indicating whether the president is serving his/her second consecutive term in office (i.e. he/she was in office from 1996-2005 in our data set). The inclusion of this variable does not alter the main results discussed in the text.

Table A.5. DID estimation with covariates for GPs reserved and unreserved for female presidents (I)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
Woman Reservation*2005	0.277 (1.27)	0.00468 (0.068)	0.00624 (0.28)	0.00643 (0.092)	-0.409 (0.52)	-0.535 (1.00)	0.110 (3.51)	-0.109 (0.18)	-0.132 (0.27)
Woman Reservation	0.187 (0.89)	0.0317 (0.048)	0.0726 (0.20)	-0.0871 (0.064)	-0.103 (0.37)	-0.246 (0.69)	0.335 (2.45)	-0.00141 (0.13)	-0.0673 (0.19)
2005	39.54*** (11.4)	1.999*** (0.61)	-0.245 (2.53)	-1.141 (0.82)	9.043* (4.70)	0.495 (8.91)	26.84 (31.5)	6.593*** (1.66)	4.217* (2.39)
1991 Female Population Ratio	-73.89*** (23.0)	-4.042*** (1.23)	1.231 (5.10)	1.970 (1.66)	-16.34* (9.49)	2.788 (18.0)	-44.23 (63.5)	-12.08*** (3.34)	-7.072 (4.83)
Constant	2.969*** (0.42)	0.225*** (0.022)	- 0.202** (0.094)	0.401*** (0.030)	2.509*** (0.17)	0.527 (0.33)	8.259*** (1.16)	-0.283*** (0.061)	-0.322*** (0.088)
Observations	288	288	284	285	287	287	288	288	288
R-squared	0.13	0.04	0.04	0.07	0.07	0.07	0.04	0.20	0.13

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, *

p<0.1.

Table A.6. DID estimation with covariates for GPs reserved and unreserved for female presidents (II)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
Woman Reservation*2005	-0.197 (1.22)	-0.0194 (0.066)	0.126 (0.27)	0.0340 (0.090)	-0.601 (0.48)	-0.504 (1.00)	-0.915 (3.41)	-0.201 (0.17)	-0.243 (0.25)
Woman Reservation 2005	0.187 (0.85)	0.0317 (0.046)	0.0726 (0.19)	-0.0871 (0.062)	-0.103 (0.33)	-0.246 (0.69)	0.335 (2.37)	-0.00141 (0.12)	-0.0673 (0.17)
1991 Female Population Ratio	-10.79 (14.9)	-0.275 (0.80)	10.72*** (3.26)	1.465 (1.10)	-13.28** (5.78)	2.526 (12.1)	-83.07** (41.4)	-3.078 (2.07)	-7.724** (3.05)
1991 SC Population Ratio	-33.70 (23.6)	-2.090 (1.27)	-8.326 (5.18)	-0.569 (1.74)	-1.427 (9.20)	0.398 (19.3)	50.86 (65.9)	-4.367 (3.29)	1.954 (4.85)
LN 1991 GP Population < 6	4.581 (2.78)	0.332** (0.15)	1.229** (0.61)	0.119 (0.20)	0.954 (1.08)	-3.578 (2.27)	-3.653 (7.75)	0.721* (0.39)	0.466 (0.57)
LN 1991 GP Population < 6	2.978** (1.50)	0.164** (0.081)	-1.084*** (0.33)	-0.219** (0.11)	1.428** (0.58)	-0.284 (1.23)	5.545 (4.19)	0.617*** (0.21)	0.898*** (0.31)
LN Total Cultivated Land 1991	-0.739 (1.26)	-0.122* (0.068)	0.530* (0.28)	0.205** (0.092)	0.768 (0.49)	0.870 (1.03)	-1.975 (3.50)	-0.152 (0.17)	-0.0526 (0.26)
Constant	1.422*** (0.54)	0.0879*** (0.029)	-0.150 (0.12)	-0.112*** (0.040)	-0.0793 (0.21)	-0.365 (0.44)	4.304*** (1.51)	0.240*** (0.075)	0.0985 (0.11)
Observations	2.969*** (0.40)	0.225*** (0.022)	-0.202** (0.089)	0.401*** (0.029)	2.509*** (0.16)	0.527 (0.33)	8.259*** (1.12)	-0.283*** (0.056)	-0.322*** (0.082)
R-squared	288	288	284	285	287	287	288	288	288
	0.21	0.12	0.15	0.14	0.25	0.08	0.11	0.34	0.25

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses); *** p<0.01, ** p<0.05, * p<0.1.

Table A.7. DID estimation with covariates for GPs reserved and unreserved for female presidents (III)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
Woman Reservation*2005	-0.664 (1.19)	-0.0763 (0.057)	-0.0117 (0.27)	0.0513 (0.089)	-0.432 (0.53)	-0.471 (1.00)	-1.570 (3.45)	-0.294* (0.17)	-0.223 (0.27)
Woman Reservation 2005	0.188 (0.83)	0.0317 (0.039)	0.0726 (0.19)	-0.0871 (0.061)	-0.103 (0.37)	-0.246 (0.69)	0.335 (2.39)	-0.00141 (0.11)	-0.0673 (0.18)
1991 Female Population Ratio	7.891 (11.6)	-0.505 (0.55)	-3.359 (2.59)	-0.263 (0.87)	7.544 (5.14)	5.945 (9.64)	-12.89 (33.4)	1.226 (1.61)	1.888 (2.59)
Vellore District	-3.648 (23.8)	1.579 (1.13)	7.448 (5.32)	-0.167 (1.79)	-13.24 (10.6)	-8.344 (19.8)	48.88 (68.6)	0.0852 (3.30)	-1.683 (5.31)
Pudukottai District	-2.750*** (0.87)	-0.306*** (0.041)	0.652*** (0.19)	0.337*** (0.065)	0.184 (0.39)	-0.838 (0.73)	-10.17*** (2.52)	-0.809*** (0.12)	-0.502** (0.19)
Constant	-6.376*** (0.94)	-0.508*** (0.045)	-0.578*** (0.21)	0.187*** (0.071)	-0.293 (0.42)	1.039 (0.78)	-8.304*** (2.71)	-1.096*** (0.13)	-0.483** (0.21)
Observations	2.969*** (0.39)	0.225*** (0.019)	-0.202** (0.088)	0.401*** (0.029)	2.509*** (0.17)	0.527 (0.32)	8.259*** (1.13)	-0.283*** (0.054)	-0.322*** (0.087)
R-squared	288	288	284	285	287	287	288	288	288
	0.25	0.35	0.16	0.16	0.07	0.09	0.10	0.37	0.15

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, * p<0.1.

Table A.8. DID estimation with covariates for GPs reserved and unreserved for female presidents (IV)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
Woman Reservation*2005	-0.672 (1.19)	-0.0764 (0.057)	-0.0113 (0.27)	0.0518 (0.089)	-0.443 (0.52)	-0.463 (1.00)	-1.594 (3.44)	-0.295* (0.17)	-0.226 (0.27)
Woman Reservation	0.467 (0.87)	0.0330 (0.041)	0.0454 (0.19)	-0.108* (0.064)	0.192 (0.38)	-0.372 (0.72)	1.143 (2.50)	0.0310 (0.12)	0.0284 (0.19)
2005	7.034 (11.6)	-0.509 (0.55)	-3.280 (2.60)	-0.191 (0.87)	6.682 (5.10)	6.327 (9.67)	-15.37 (33.5)	1.126 (1.61)	1.594 (2.59)
1991 Female Population Ratio	-1.958 (23.8)	1.587 (1.13)	7.294 (5.34)	-0.310 (1.79)	-11.54 (10.5)	-9.095 (19.9)	53.78 (68.8)	0.282 (3.31)	-1.104 (5.31)
Test Score	0.105 (0.098)	0.000499 (0.0047)	-0.0104 (0.022)	-0.00789 (0.0073)	0.111** (0.043)	-0.0474 (0.082)	0.303 (0.28)	0.0122 (0.014)	0.0359 (0.022)
Vellore District	-2.645*** (0.88)	-0.306*** (0.042)	0.642*** (0.20)	0.329*** (0.065)	0.301 (0.39)	-0.888 (0.73)	-9.864*** (2.53)	-0.797*** (0.12)	-0.466** (0.20)
Pudukottai District	-6.424*** (0.94)	-0.508*** (0.045)	-0.574*** (0.21)	0.191*** (0.071)	-0.343 (0.41)	1.058 (0.79)	-8.444*** (2.71)	-1.102*** (0.13)	-0.499** (0.21)
Constant	1.893* (1.08)	0.219*** (0.051)	-0.0957 (0.24)	0.482*** (0.080)	1.374*** (0.47)	1.013 (0.90)	5.147* (3.12)	-0.408*** (0.15)	-0.690*** (0.24)
Observations	288	288	284	285	287	287	288	288	288
R-squared	0.25	0.35	0.16	0.16	0.10	0.09	0.10	0.38	0.16

Notes: Observations are at the GP level in 1991 and 2005.

Standard errors are given in (parentheses).

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.9. DID estimation with covariates for GPs reserved and unreserved for female presidents (V)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
Woman Reservation*2005	-0.662 (1.20)	-0.0762 (0.057)	-0.0110 (0.27)	0.0529 (0.088)	-0.436 (0.53)	-0.484 (1.00)	-1.652 (3.42)	-0.297* (0.17)	-0.225 (0.27)
Woman Reservation	0.172 (0.83)	0.0307 (0.040)	0.0659 (0.19)	-0.0984 (0.062)	-0.0790 (0.37)	-0.168 (0.69)	0.918 (2.39)	0.0162 (0.12)	-0.0542 (0.19)
2005	8.027 (11.6)	-0.496 (0.55)	-3.302 (2.60)	-0.147 (0.87)	7.331 (5.16)	5.272 (9.66)	-17.99 (33.3)	1.072 (1.61)	1.773 (2.60)
1991 Female Population Ratio	-3.925 (23.9)	1.561 (1.13)	7.334 (5.34)	-0.402 (1.79)	-12.81 (10.6)	-6.978 (19.8)	59.24 (68.3)	0.398 (3.30)	-1.450 (5.33)
Second Term for President	-0.0942 (0.55)	-0.00603 (0.026)	-0.0426 (0.12)	-0.0676* (0.041)	0.143 (0.24)	0.468 (0.46)	3.528** (1.57)	0.107 (0.076)	0.0794 (0.12)
Vellore District	-2.754*** (0.87)	-0.307*** (0.042)	0.650*** (0.20)	0.334*** (0.065)	0.190 (0.39)	-0.812 (0.73)	-9.990*** (2.50)	-0.804*** (0.12)	-0.498** (0.20)
Pudukottai District	-6.368*** (0.94)	-0.508*** (0.045)	-0.575*** (0.21)	0.194*** (0.071)	-0.305 (0.42)	1.003 (0.78)	-8.592*** (2.69)	-1.105*** (0.13)	-0.489** (0.21)
Constant	2.999*** (0.43)	0.226*** (0.020)	-0.189* (0.097)	0.423*** (0.032)	2.463** (0.19)	0.376 (0.36)	7.125*** (1.23)	-0.318*** (0.059)	-0.347*** (0.096)
Observations	288	288	284	285	287	287	288	288	288
R-squared	0.25	0.35	0.16	0.16	0.08	0.09	0.11	0.38	0.15

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, * p<0.1.

Table A.10. DID estimation with covariates for GPs reserved and unreserved for SC presidents (I)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
SC Reservation*2005	1.389 (1.58)	0.0771 (0.084)	-0.355 (0.34)	0.0534 (0.11)	-0.323 (0.64)	-0.307 (1.21)	0.571 (4.26)	-0.118 (0.23)	-0.267 (0.32)
SC Reservation 2005	-0.504 (1.03)	0.00120 (0.055)	0.0652 (0.22)	-0.0624 (0.073)	-0.372 (0.42)	-0.148 (0.79)	-0.655 (2.78)	-0.0329 (0.15)	-0.198 (0.21)
1991 SC Population Ratio	2.686*** (0.88)	-0.0345 (0.047)	-0.101 (0.19)	-0.236*** (0.063)	0.742** (0.36)	2.443*** (0.68)	7.288*** (2.38)	0.519*** (0.13)	0.622*** (0.18)
Constant	-0.0824 (3.35)	0.0594 (0.18)	2.304*** (0.72)	0.300 (0.24)	0.614 (1.37)	-2.764 (2.57)	-10.96 (9.06)	0.294 (0.49)	0.413 (0.69)
Observations	3.091*** (0.41)	0.231*** (0.022)	-0.196** (0.089)	0.391*** (0.029)	2.545*** (0.17)	0.496 (0.31)	8.438*** (1.11)	-0.278*** (0.060)	-0.305*** (0.085)
R-squared	288	288	284	285	287	287	288	288	288
	0.10	0.01	0.07	0.07	0.06	0.07	0.05	0.16	0.13

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, * p<0.1.

Table A.11. DID estimation with covariates for GPs reserved and unreserved for SC presidents (II)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
SC Reservation*2005	1.995 (1.49)	0.0983 (0.080)	-0.483 (0.33)	0.0368 (0.11)	0.0635 (0.58)	-0.237 (1.22)	1.355 (4.16)	-0.00679 (0.21)	-0.103 (0.31)
SC Reservation 2005	-0.504 (0.96)	0.00120 (0.052)	0.0652 (0.21)	-0.0624 (0.071)	-0.372 (0.38)	-0.148 (0.79)	-0.655 (2.69)	-0.0329 (0.14)	-0.198 (0.20)
1991 SC Population Ratio	-11.33 (14.4)	-0.360 (0.78)	10.08*** (3.16)	1.690 (1.08)	-10.53* (5.66)	5.445 (11.8)	-81.23** (40.3)	-2.294 (2.03)	-6.457** (2.97)
1991 Female Population Ratio	2.507 (3.19)	0.195 (0.17)	1.829*** (0.70)	0.150 (0.24)	1.314 (1.25)	-3.112 (2.61)	-4.680 (8.91)	0.758* (0.45)	0.855 (0.66)
LN 1991 GP Population	-34.01 (22.9)	-2.027 (1.23)	-6.966 (5.01)	-0.913 (1.69)	-5.925 (8.98)	-4.279 (18.7)	46.97 (63.9)	-5.674* (3.21)	-0.00955 (4.71)
LN 1991 GP Population < 6	3.181** (1.49)	0.180** (0.080)	-1.101*** (0.33)	-0.233** (0.11)	1.242** (0.59)	-0.466 (1.23)	5.523 (4.18)	0.570*** (0.21)	0.793** (0.31)
LN Total Cultivated Land 1991	-0.809 (1.25)	-0.129* (0.067)	0.522* (0.27)	0.214** (0.092)	0.881* (0.49)	0.969 (1.03)	-1.927 (3.49)	-0.121 (0.18)	0.00532 (0.26)
Constant	1.372** (0.54)	0.0845*** (0.029)	-0.135 (0.12)	-0.112*** (0.040)	-0.0704 (0.21)	-0.355 (0.44)	4.279*** (1.51)	0.241*** (0.076)	0.108 (0.11)
Observations	3.091*** (0.39)	0.231*** (0.021)	-0.196** (0.085)	0.391*** (0.028)	2.545*** (0.15)	0.496 (0.32)	8.438*** (1.08)	-0.278*** (0.054)	-0.305*** (0.079)
R-squared	288	288	284	285	287	287	288	288	288
	0.22	0.12	0.15	0.13	0.24	0.08	0.11	0.33	0.24

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses); *** p<0.01, ** p<0.05, * p<0.1.

Table A.12. DID estimation with covariates for GPs reserved and unreserved for SC presidents (III)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
SC Reservation*2005	1.742 (1.44)	0.110 (0.068)	-0.400 (0.32)	0.0228 (0.11)	-0.328 (0.64)	-0.268 (1.20)	1.446 (4.15)	-0.0366 (0.20)	-0.222 (0.32)
SC Reservation 2005	-0.504 (0.94)	0.00120 (0.044)	0.0652 (0.21)	-0.0624 (0.070)	-0.372 (0.42)	-0.148 (0.78)	-0.655 (2.70)	-0.0329 (0.13)	-0.198 (0.21)
1991 SC Population Ratio	6.729*** (0.98)	0.282*** (0.046)	-0.0422 (0.22)	-0.411*** (0.074)	0.974** (0.44)	2.159*** (0.82)	13.44*** (2.82)	1.252*** (0.14)	0.978*** (0.22)
Vellore District	-4.432 (3.13)	-0.211 (0.15)	1.610** (0.70)	0.302 (0.24)	0.0842 (1.40)	-1.597 (2.61)	-12.96 (9.03)	-0.252 (0.44)	0.225 (0.70)
Pudukottai District	-2.741*** (0.84)	-0.294*** (0.040)	0.698*** (0.19)	0.335*** (0.063)	0.176 (0.38)	-0.789 (0.71)	-9.434*** (2.44)	-0.772*** (0.12)	-0.462** (0.19)
Constant	-6.594*** (0.85)	-0.486*** (0.041)	-0.387** (0.19)	0.203*** (0.065)	-0.504 (0.38)	0.827 (0.72)	-8.083*** (2.46)	-1.093*** (0.12)	-0.498*** (0.19)
Observations	3.091*** (0.37)	0.231*** (0.018)	-0.196** (0.084)	0.391*** (0.028)	2.545*** (0.17)	0.496 (0.31)	8.438*** (1.08)	-0.278*** (0.053)	-0.305*** (0.084)
R-squared	288	288	284	285	287	287	288	288	288
	0.26	0.35	0.17	0.16	0.07	0.09	0.10	0.36	0.16

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, *

p<0.1.

Table A.13. DID estimation with covariates for GPs reserved and unreserved for SC presidents (IV)

	(1) Number of Borewells	(2) Distance (km) to Nearest Borewell	(3) Health	(4) Distance (km) to Nearest Concrete Road	(5) Schools	(6) Public Toilets	(7) Bus and Minibus Trips	(8) Household Water or Pipeline Connection	(9) Streetlights
SC Reservation*2005	1.693 (1.44)	0.110 (0.068)	-0.393 (0.32)	0.0240 (0.11)	-0.397 (0.63)	-0.262 (1.20)	1.324 (4.15)	-0.0465 (0.20)	-0.243 (0.32)
SC Reservation	-0.456 (0.94)	0.00116 (0.045)	0.0584 (0.21)	-0.0637 (0.070)	-0.310 (0.41)	-0.154 (0.78)	-0.534 (2.71)	-0.0229 (0.13)	-0.176 (0.21)
2005	6.678*** (0.98)	0.282*** (0.047)	-0.0341 (0.22)	-0.409*** (0.074)	0.907** (0.43)	2.167*** (0.82)	13.31*** (2.82)	1.242*** (0.14)	0.955*** (0.22)
1991 SC Population Ratio	-4.258 (3.13)	-0.211 (0.15)	1.586** (0.70)	0.298 (0.24)	0.322 (1.38)	-1.619 (2.62)	-12.52 (9.05)	-0.217 (0.44)	0.303 (0.70)
Test Score	0.0905 (0.089)	-0.0000888 (0.0043)	-0.0144 (0.020)	-0.00247 (0.0067)	0.116*** (0.039)	-0.0114 (0.075)	0.228 (0.26)	0.0187 (0.013)	0.0404** (0.020)
Vellore District	-2.662*** (0.85)	-0.294*** (0.040)	0.686*** (0.19)	0.333*** (0.063)	0.284 (0.38)	-0.800 (0.71)	-9.235*** (2.45)	-0.756*** (0.12)	-0.427** (0.19)
Pudukottai District	-6.616*** (0.85)	-0.486*** (0.041)	-0.384** (0.19)	0.204*** (0.065)	-0.532 (0.38)	0.829 (0.72)	-8.140*** (2.47)	-1.098*** (0.12)	-0.508*** (0.19)
Constant	2.208** (0.95)	0.232*** (0.045)	-0.0568 (0.21)	0.415*** (0.071)	1.417*** (0.42)	0.608 (0.80)	6.216** (2.74)	-0.460*** (0.13)	-0.699*** (0.21)
Observations	288	288	284	285	287	287	288	288	288
R-squared	0.26	0.35	0.17	0.16	0.10	0.09	0.10	0.37	0.17

Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, * p<0.1.

Table A.14. DID estimation with covariates for GPs reserved and unreserved for SC presidents (V)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of borewells	Distance (km) to nearest borewell	Health	Distance (km) to nearest concrete road	Schools	Public toilets	Bus and minibus trips	Household water or pipeline connection	Streetlights
SC Reservation*2005	1.742 (1.44)	0.110 (0.068)	-0.400 (0.32)	0.0224 (0.11)	-0.330 (0.64)	-0.272 (1.20)	1.409 (4.12)	-0.0379 (0.20)	-0.223 (0.32)
SC Reservation	-0.506 (0.94)	0.000981 (0.045)	0.0638 (0.21)	-0.0642 (0.070)	-0.366 (0.42)	-0.133 (0.78)	-0.559 (2.68)	-0.0293 (0.13)	-0.195 (0.21)
2005	6.729*** (0.98)	0.282*** (0.046)	-0.0426 (0.22)	-0.412*** (0.074)	0.975** (0.44)	2.157*** (0.82)	13.45*** (2.80)	1.253*** (0.14)	0.978*** (0.22)
1991 SC Population Ratio	-4.430 (3.13)	-0.210 (0.15)	1.615** (0.70)	0.309 (0.24)	0.0754 (1.40)	-1.614 (2.61)	-13.07 (8.97)	-0.257 (0.44)	0.222 (0.70)
Second Term for President	-0.0613 (0.54)	-0.00784 (0.026)	-0.0701 (0.12)	-0.0578 (0.040)	0.208 (0.24)	0.536 (0.45)	3.389** (1.54)	0.124 (0.075)	0.103 (0.12)
Vellore District	-2.744*** (0.85)	-0.295*** (0.040)	0.694*** (0.19)	0.331*** (0.063)	0.187 (0.38)	-0.753 (0.71)	-9.224*** (2.42)	-0.765*** (0.12)	-0.456** (0.19)
Pudukottai District	-6.591*** (0.86)	-0.486*** (0.041)	-0.385** (0.19)	0.207*** (0.065)	-0.513 (0.38)	0.808 (0.72)	-8.228*** (2.45)	-1.098*** (0.12)	-0.502*** (0.19)
Constant	3.109*** (0.41)	0.234*** (0.019)	-0.177* (0.091)	0.408*** (0.030)	2.485*** (0.18)	0.341 (0.34)	7.458*** (1.16)	-0.314*** (0.057)	-0.335*** (0.091)
Observations	288	288	284	285	287	287	288	288	288
R-squared	0.26	0.35	0.17	0.16	0.07	0.09	0.12	0.37	0.16

Notes: Observations are at the GP level in 1991 and 2005.

Time-invariant variables are interacted with year to capture effects due to reservation selection based on 1991 population data.

Standard errors are given in (parentheses).

*** p<0.01, ** p<0.05, * p<0.1.

A.3. Propensity Score Matching Estimation

In the case of women's reservations, we argue that although women's reservations are based on female population ratios, the reservations are not related to any unobservable determinants of public goods provision. The additional observation that women-reserved GPs show no major differences versus non-reserved GPs further supports this claim. We therefore propose that the DID estimation of the treatment effect for women-reserved GPs is reliable, and we show this is robust to model specifications controlling for the selection of reservation and other covariates.

In the case of SC-reserved GPs, there are relatively larger differences in SC population ratios between GPs within a block, which could cause concern that different trends may exist in higher and lower SC-population ratio GPs. Therefore, in addition to the DID and DID with covariates estimation results presented in the main text, we also compare our DID estimates to propensity score matching estimators.

A.3.1. An Explanation of Propensity Score Matching Estimation

Matching estimation compares the outcomes of treated and untreated individuals by linking individuals with similar attributes. In propensity score matching, this linking is based on matching individuals with similar probabilities of receiving the treatment. The probability of receiving treatment is called the propensity score, and is calculated using a probit model of the form

$$P(X) = \Pr(D = 1|X),$$

where X is a set of conditioning variables and D is an indicator variable for treatment. The idea behind matching is that, conditional on some variables X , the outcomes of the treated and untreated are independent (Heckman et al., 1997).

The selection of variables used in calculating the propensity score for each village is a tricky issue, and the current literature is low on guidance and significance tests for the choice of conditioning variables (Gilligan and Hoddinott, 2007). In our case, however, we have an excellent set of variables on which to match. Because SC reservations were supposed to be made based on the SC population ratio in GPs, and because this rule was not strictly followed, we have a very natural conditioning variable of the SC population ratio. Additionally, our mean comparison indicates that SC reserved villages tend to be smaller. Thus, we use population measures and land area measures, in addition to the SC population ratio, to calculate the propensity score.

The PSM estimator yields the average treatment effect on the treated, which tells us the average impact of reservation on GPs receiving them. In other words, the PSM estimator tells us by how much the reserved GPs' public goods provision differed from the public goods they would have received if they weren't reserved. Because we have data from before and after reservation took place, we use a difference-in-differences (DID) propensity score matching estimation procedure. Heckman et al. (1997) show that incorporating a DID component into PSM is generally superior to conventional PSM in terms of removing bias from the treatment effect estimates. Letting Y be the outcome variable of interest, $t = 1, 2$ be the before- and after-treatment time periods of interest, respectively, and R and U stand for reserved and unreserved GPs, the DID PSM estimator is given by

$$\begin{aligned}\Delta_{\text{DID PSM}} &= E[(Y_R^2 - Y_U^2) - (Y_R^1 - Y_U^1) | X, D=1] \\ &= E[(Y_R^2 - Y_R^1) | X, D=1] - E[(Y_U^2 - Y_U^1) | X, D=1].\end{aligned}$$

A.3.2. Results from Propensity Score Matching Estimation

Because PSM estimation can be sensitive to the choice of variables for calculating the propensity score, we use four different specifications for estimating the propensity score. All yield similar results, as shown in Table A.15.²⁶ The selection of variables for calculating the propensity score is straightforward; because

²⁶ We thank Daniel Gilligan in the Food Consumption and Nutrition Division of IFPRI for sharing his Stata code for the

GPs were imperfectly selected for reservation based on their SC population ratio, a natural choice for one of our conditioning variables is a village's SC population ratio. In the specifications below, we use various combinations of the following variables for our estimation of the propensity score: the SC population ratio, total SC population, female population ratio, total female population, total village population, total village population under six years of age, and total village land area. In Table 3, we see that SC-reserved villages tend to be smaller in population, since higher-SC population ratio villages (which tend to be smaller) were given a reservation. We therefore use this, and other variables correlated with villages having a higher percentage of SC persons, as our conditioning variables. The estimates shown in Table 11 are the average treatment effect on the treated (ATT), i.e. the difference in public goods provision experienced by SC-reserved GPs, which would not have been present had these GPs not been reserved.

These results confirm the findings from the DID estimation in sign and magnitude, though the statistical significance is not strong. Although not significant, the matching estimates are consistent with our finding that SC-reserved villages had an increase of one to two more borewells than non-SC reserved GPs. These results are also consistent—and significant in two specifications of the propensity score—with the finding that the borewells are further away from the city center in SC-reserved GPs versus non-SC-reserved GPs.

A.3.3. Graphs of the Common Support for DID PSM in SC-Reserved GPs

Figures 9-12 depict the regions of common support for the DID PSM estimation in SC-reserved GPs. The common support region identifies the areas where both treated and non-treated villages overlap in propensity score, allowing them to be ‘matched’ together in the analysis.

Table A.15. DID PSM estimates of the average treatment effect on the treated

	ATT: Difference in average change from 1991 to 2005			
	1	2	3	4
Number of borewells	1.71 (1.81)	1.90 (1.83)	1.24 (1.85)	1.41 (1.80)
Distance to nearest borewell	0.14 (0.11)	0.18 (0.12)	0.18* (0.11)	0.18* (0.10)
HEALTH - Composite measure	-0.24 (0.35)	-0.36 (0.34)	-0.04 (0.33)	-0.01 (0.28)
Distance to nearest concrete road	0.03 (0.08)	0.06 (0.08)	0.07 (0.08)	0.14* (0.08)
Number of schools	-0.36 (0.43)	-0.77* (0.42)	-0.48 (0.46)	-0.43 (0.42)
Number of public toilets	-0.56 (0.97)	-1.09 (1.00)	-0.11 (0.74)	-0.14 (0.58)
Number of bus and minibus trips	-3.63 (2.92)	-2.49 (2.92)	-0.48 (2.94)	-1.68 (2.56)
Household pipeline or toilet connection	-0.09 (0.37)	-0.07 (0.35)	-0.37 (0.32)	-0.23 (0.32)
STREETLIGHTS - Composite measure	-0.26 (0.20)	-0.08 (0.20)	-0.31* (0.18)	-0.13 (0.17)
# of Observations in common support	102	103	127	136

Notes: Bootstrapped Standard Errors given in parentheses, using 1000 replications.

*** p<.01, ** p<.05, * p<.10.

Conditioning variables in Model (1): female population ratio, SC population ratio, total population under six years of age, total population, total village cultivated land area. Conditioning variables in Model (2): SC population ratio, total population under six years of age, total population, total village cultivated land area. Conditioning variables in Model (3): total female population, total SC population, total population under six years of age, total population, total village cultivated land area.

Conditioning variables in Model (4): total SC population, total population under six years of age, total population, total village cultivated land area

estimation given in Table 29 and the graphs in Figures 9-12.

Figure A.7. DID PSM, common support for Model 1

Model 1 uses the following conditioning variables: female population ratio, SC population ratio, total population under six years of age, total population, and total cultivated land area in the village.

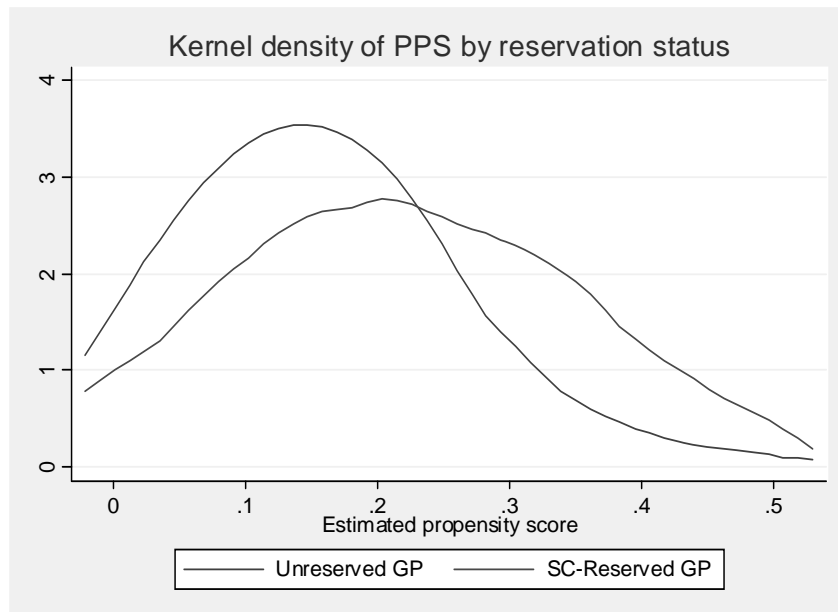


Figure A.8. DID PSM, common support for Model 2

Model 2 uses the following conditioning variables: SC population ratio, total population under six years of age, total population, and total cultivated land area in the village.

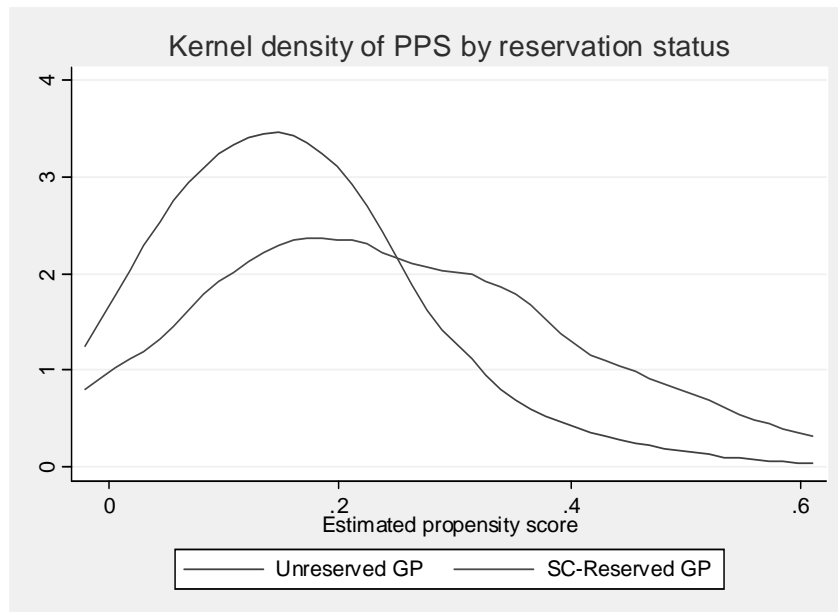


Figure A.9. DID PSM, common support for Model 3

Model 3 uses the following conditioning variables: total female population, total SC population, total population under six years of age, total population, and total cultivated land area in the village.

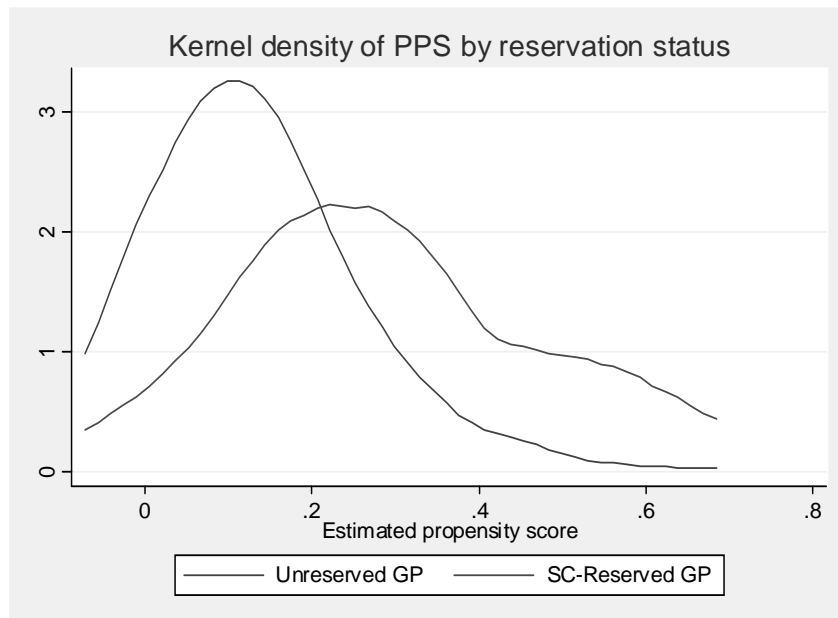
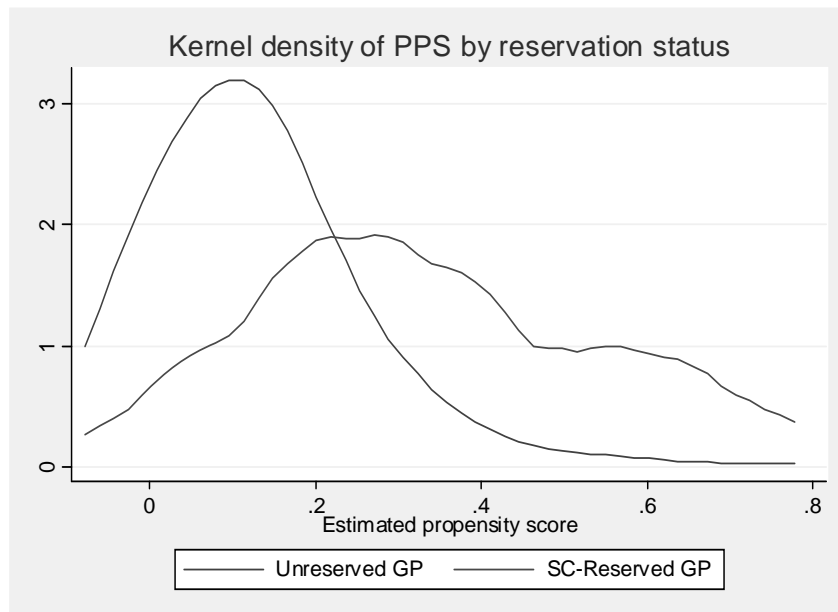


Figure A.10. DID PSM, common support for Model 4

Model 4 uses the following conditioning variables: total SC population, total population under six years of age, total population, and total cultivated land area in the village.



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Washington, DC 20006-1002 USA
Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org

IFPRI ADDIS ABABA

P. O. Box 5689
Addis Ababa, Ethiopia
Tel.: +251 11 6463215
Fax: +251 11 6462927
Email: ifpri-addisababa@cgiar.org

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CG Block, NASC Complex, PUSA
New Delhi 110-012 India
Tel.: 91 11 2584-6565
Fax: 91 11 2584-8008 / 2584-6572
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